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OFFICE OF EXPERIMENT STATIONS
A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

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EDITORIAL NOTES.

SPECIAL ARTICLE.

STATION PUBLICATIONS ABSTRACTED.

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CONTENTS OF VOL. XX, NO. 1.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FOODS—HUMAN NUTRITION.

VETERINARY MEDICINE.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

U. S. Department of Agriculture.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XX. SEPTEMBER, 1908. No. 1.

The call for men to carry on the work of the agricultural colleges and experiment stations has continued unabated during the past year. At this season, when changes are being made and new plans put into effect, the demand is especially imperative. It comes with particular stress for men to fill the higher positions in the work of these institutions, notably the advanced work in the experiment stations.

The difficulty of filling positions satisfactorily is increasing as the demand becomes more exacting. Standards have changed materially in the last few years. More and more emphasis is being laid on new appointees having had broad training, in addition to their college course. Less stress than formerly is laid on the practical training and experience, and more upon a thorough grounding in the principles of science and a true conception of the spirit and methods of research. Given the latter, a sufficient familiarity with practice to bring the investigator into touch with its problems may be acquired; but the reverse does not follow.

The change in character of the demand has been gradual but steady. Already it has left behind many who started out in the work originally, or even a decade ago. The development of stations all over the country has presented such differences in standards and in grade of work that in the past men with but little special training beyond the college course have usually been able to find places in the work, if they combined other desirable qualities. Gradually, however, the necessity for more advanced study of agricultural problems has become widespread; and especially since the passage of the Adams Act the attempt to inaugurate more work of that class has been general throughout the country. The latter has exercised an unmistakable influence on the work of the stations as a whole, and has thus made new demands on the personnel, present and prospective. It has directed more attention to investigation and to the necessary preparation for it.

The first effort in inaugurating these investigations was to conduct them mainly with the staff which the station already had. Men who could be added for this purpose were scarce, and furthermore the

actual requirements were not always fully appreciated. It is not surprising therefore that difficulties were encountered. Comparatively few of the men had been educated and trained for thoroughgoing investigation, and hence the number who fully understood the spirit and the meaning of scientific investigation was not large.

Out of any large body of men interested in science only a few are really productive in investigation. This is evidenced by the record of any large scientific society, or even of any large university. While there are many men publishing the results of their work, much of which is of value, especially in cumulative form, there is a comparatively small number whose work is conspicuous for originality of thought and for marking distinct advance. This is in some degree due to the fact that the general average is already higher than formerly, but it is also due to the fact that genuine research ability is rare. Hence in any branch of science a considerable body of workers is essential to a satisfactory output. There must be a quite large number of men engaged before the amount of actually productive research is such as to attract much attention.

This is as true in station work as elsewhere. Out of a comparatively small number who have prepared themselves for original scientific work there will necessarily be but few who will exhibit special aptitude and ability, and not until a considerable number have been developed who have an interest and zeal for agricultural investigation will there be a sufficiently large body of genuine investigators to lead thought and promulgate the spirit of that work. Hence when the Adams fund came there were comparatively few who were able to formulate productive lines of original research—undertakings in which for the time being the consideration of principles predominated over the development of rules for practice.

The result has been that the investigation under that fund has not all been of uniformly high grade. Some has been abandoned or turned over to other funds, and some has been reshaped and strengthened in plan as a result of conference and advice. Much can be done by way of suggestion, but it is becoming evident that no amount of planning will make an undertaking a piece of research unless the guiding hand of the man in charge places it there. The man may be aided by suggestion and counsel in shaping his investigation, but his own genius will determine its ultimate quality. Research is an individual product, an expression not only of the man's technical knowledge but of his mental grasp and acumen.

It is time that the kind of men required for station work was more fully understood. This applies to the stations themselves, as well as to the men electing to enter that field. It applies to the experimental work of the station as a whole, as well as to its research work. The

station is a scientific institution. Its work in every department must be on a basis that will command the respect and confidence of scientific men as well as of the farmers. Moreover, it must be progressive, advancing, going higher and higher as it develops. How can this be the case if it runs against human limitations almost at the outset?

Not all men entering the station work are to become investigators in the scientific sense. It will not be exacted of them. There are various grades of station work which have to be provided for; but the standards for all classes of work are steadily advancing. We can not always be expected to continue comparing varieties of cabbage or strawberries to determine which are best for the market gardener to grow. We shall advance to a grade of work a step higher—perhaps show him how he himself can improve varieties, and then what characters are correlated with certain qualities. We shall lead him and make him more independent, rather than keeping him dependent and allowing his inertia to hold the station back.

Hence the men who now enter the work must be trained so that they can see the real problems and have the right perspective as to values. They must be able to make their work progressive in character and to bring into it more and more real investigation—features which aim at establishing some of the fundamental facts. Then their work will become productive. If the man lacks sufficiently broad training and perspective, he will not be able to do this creative kind of work, no matter how hard he tries. His department will mark time, or the station will have to find someone to take his place. So in selecting their new men, the stations must secure, as far as possible, men who have the desire, the qualifications, and the broad outlook for progressive work, even though circumstances may for awhile keep them at some rather elementary tasks.

For the research work which the station is to enter upon at once it must have broadly educated and mature scientists, men who know what constitutes the essentials of investigation and are able to apply these to agricultural problems. No matter how sincere and earnest a station may be in its desire to carry on advanced investigation, it will fall short of attaining this end unless it has the men suited by taste and preparation. It can not develop a corps of productive investigators out of men who lack this foundation. The man whose fundamental training has not been of such extent and character as to give him the right point of view at the start, will be able to grasp only feebly the kind of work which is wanted of him or to adapt himself efficiently to it. Not only will he not be resourceful in investigation, but he will not have correct ideas of values and can not grow into the position of a directing head of a department. The qualities which fit a man for investigation are not picked up, except to a limited degree. They are distinctly a product of his education, supple-

mented by a natural aptitude. These qualities become a part of his nature as exhibited in his habit of thought, the evidence he requires to satisfy his mind.

We need in some quarters a clearer understanding of what research is and of the methods of science which characterize it. The lack of this knowledge is a stumbling block to some men who have aspired to undertake Adams fund work. It can not be otherwise, and until a proper conception of this grade of work and its requirements becomes more widespread, our investigation will not attain the position which we hope for it.

A great deal of our "research" is not started right and can not lead to definite conclusions of scientific value until different methods are practiced. The accumulation of data, whether analyses or observations, in an indefinite way, in the hope that they will shed light or furnish a clew which will suggest a starting point or give an empirical answer, is expensive and seldom leads up to an investigation.

Research does not spring merely from a desire to further human knowledge. It is conditioned on certain qualities in the man, developed in part through his training and in part inherent in himself. The foundations of it are laid in an attitude which demands a scientific reason for observed phenomena, a knowledge which enables the subject to be approached intelligently, and skill and judgment in the handling and interpretation of data. We may have the desire to know the fundamental reason why a given soil becomes infertile; but unless we have a sufficiently broad training to discern the point of attack, to formulate a plan of investigation, taking advantage of what is already known, and to interpret the results in a logical and scientific manner, research will be out of the question.

An investigator can not be made, even by the most careful attention to his training and preparation. His ultimate success will depend upon something within himself which can not be supplied from the outside. But a great deal can be done in developing the resources he possesses, in directing his study along broad lines, and in inculcating the scientific spirit. These things are a product of special graduate work of university grade. They require a favorable atmosphere for their development.

The recognition of these facts is leading station directors to an increasing degree to require higher qualifications in their new men. They are looking for men who have had substantial graduate courses in science equivalent to the work of the larger universities, which shall have brought them into direct contact with research work and given them not only the technical knowledge and training in methods, but correct discrimination and an inspiration which lie at the very basis of successful investigation.

The idea has been current to some extent that the stations could train their own men, at least in part. This has led to the not unusual practice of taking men direct from the college course and putting them through a sort of apprenticeship in station work, which has been accepted by the men as equivalent to a graduate course in a university. As a matter of fact, this is usually far from being the case. The stations can advise men in their reading, can assist them in getting a clear conception of the spirit of their work, and can stimulate them to secure more adequate preparation through university courses. But it must be left to the colleges and the universities to provide courses of instruction which prepare men to undertake advanced work and give them the proper point of view. They must bring to the station a thorough start in their education for its work.

The stations on their part should stimulate their men to pursue advanced study if they are to rise above the grade of a quite subordinate assistant. It should give them no encouragement to think that in the present status of station work they can get along without it. Indeed, they might well make such graduate study a condition of advancement to a position of independent work, as some have already done.

In the past the stations have had very largely to adapt such men as the market afforded to their special field of work. This must always be the case to some extent. The work is so special that no institution could be looked upon to provide courses of instruction in it. But this is quite different from providing the fundamental education. Education is not only the imbibing of information but the securing of a point of view and an ability to work out problems for one's self. This is the work of the preparatory institution. The value of a scientific fact and the method by which it is established is a part of a man's scientific education. Without it he will have distinct limitations as a station man, and will never be able to progress far in independent work.

The question is already being asked whether the courses of the agricultural colleges provide men with the proper groundwork for station investigators. In some cases, at least, they clearly do not inculcate the point of view which the prospective station man should have. He does not receive a correct idea of values as applied to different classes of experimental work, or a true conception of the relations which science bears to the practical art of agriculture. The means by which science may be made to clear up the mysteries of plant and animal growth are not always brought home to the student, even in an elementary way, and the relative merits of different kinds of experimentation and investigation are rarely presented in such a way as to give him a true perspective or an intelligent discrimination.

In other words, he gathers little of the real spirit of investigation or of the scientific method in settling questions. In the past many of the graduates have left the course with much the same feeling that the farmer has—that practical trials and simple experiments under conditions which imitate practice will be sufficient to determine the best methods and furnish rules for farming. Beyond this they have not had impressed upon them the needs of agriculture in a broad and more fundamental sense.

If one of the main objects of the college education is to teach correct ideas of values, it would seem that this should be extended to the subject which touches the agricultural student most closely. The work of the stations furnishes a great variety of material for such instruction, and it might with advantage be made a part of the required course. Agricultural education is not complete unless it teaches the student the meaning of experiment station work—the significance of investigation as well as of the more immediately practical experiments, and enables him to use the results intelligently and with some discrimination.

The experiment station is one of the fields open to the graduate in agriculture. In the past it has looked to the agricultural college as the source from which to recruit its forces. The station investigator should be the highest product of the agricultural course, and as such may be accorded some special attention in its courses. This does not minimize the position of the farmer graduate, or the man who has gained a new touch with nature through its course, or the agricultural editor whose effort is to lead agricultural thought. But the discoverer of truth, the man who is adding to the store of knowledge, is furnishing the stock in trade of the farmer, the writer, and the teacher. He stands at the head of the system, indispensable to further progress, and marking the highest stage in the application of his education. He is therefore worthy of special care in his training, for potentially he represents the highest type of product.

Formerly when there were only a few State stations the encouragement to young men to spend time and money preparing for a career in that field was quite restricted. The conception of the need of special preparation has rested with the stations, and not until they demanded it and made it a condition of appointment was provision made to meet it. Now the colleges are establishing graduate courses and giving more attention to advanced study. Whether or not they will be able to turn out men with the highest type of preparation is a vital question.

The opportunity for a career in station work is now at hand. The stations in the development of their work have furnished the incentive to young men to prepare themselves thoroughly for this field. The grade of work is steadily advancing throughout the country. The

opportunity for advanced work freed from the distraction of other duties is making the field more attractive. The man of faulty preparation will soon find his limitations, and the discovery may and often will come too late to be rectified. A requirement of broad and thorough preparation is in the ultimate interest of the man as well as of the station.

The effect of the Graduate School of Agriculture the past summer in opening up the field of agricultural investigation and broadening the view of those in attendance regarding the problems and methods of investigation, was perhaps its most important influence. The opportunity for coming into intimate contact with so many leading men in that work was a rare one. It was especially beneficial to young men preparing to enter the experiment stations. It not only served to familiarize them with the present status of knowledge on special subjects, but it inculcated higher ideals as to the character of work to be done and the preparation necessary to undertake it.

The real nature of many intricate problems in agriculture and their relation to the fundamental sciences were brought home with a new force. To many a man this school presented the first real conception of the true scope of the field in which he was working. To some the discovery was well-nigh overwhelming, while to others it was stimulating to a high degree, and inspired them with a desire for further study. To all it was broadening and imparted something more of the spirit of investigation.

53818—No. 1—08——2

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

On the theory of indicators and the reactions of phthaleins and their salts, S. F. Acree (*Amer. Chem. Jour., 39 (1908), No. 4, pp. 528–544*).—The essential point brought out in this discussion is that "the chief cause of this color [in case of phenolphthalein and similar compounds] is not the colored quinone group . . . but the double compound formed by the inter- or intramolecular union of the quinone complex with the free aniline (or aniline hydroxid) groups of the dyestuff."

Note on the determination of potash by the perchlorate method in fertilizers, soils, manures, crops, etc., V. Schenke (*Landw. Vers. Stat., 68 (1908), No. 1–2, pp. 61–65; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 546, II. p. 321; Chem. Ztg., 32 (1908), No. 36, Repert., pp. 238, 239*).—The author calls attention to certain difficulties encountered in applying his method (E. S. R., 19, p. 613) to the determination of potash in soils rich in lime and in solutions containing strong acids, particularly sulphuric acid. To overcome such difficulties he recommends a procedure which is in the main the same as that followed in the modified Finkener platinic chlorid method which he has previously described. In this the sulphuric acid is removed by evaporation and careful heating over a direct flame, the residue taken up in a small amount of 5 per cent hydrochloric acid, the sulphuric acid precipitated with the smallest possible excess of 10 per cent barium chlorid, and other salts removed by the addition of alkali-free milk-of-lime. After standing about one-half hour an aliquot part of the filtrate from these precipitations is acidified with hydrochloric acid and potash precipitated with 20 per cent perchloric acid. A comparison of this method with the ordinary perchlorate method showed that the modified method gave somewhat higher results than the original method.

On the use of nitron for the determination of nitric acid in soils and plants, J. Litzendorff (*Ztschr. Angew. Chem., 20 (1907), No. 51, pp. 2209–2213; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 2, p. 83; Jour. Chem. Soc. [London], 94 (1908), No. 544, II, pp. 130, 131; Bul. Soc. Chim. France, 4. ser., 4 (1908), No. 5, p. 341*).—In the use of this method for determining nitric acid in soils 2 kg. of the soil is shaken for ½ hour with 4 kg. of water according to the method of Buhlert and Fickendey (E. S. R., 17, p. 832). To 100 cc. of the solution thus obtained, heated to boiling, 5 to 10 cc. of 10 per cent nitron acetate solution is added and the solution kept in ice or ice water until the precipitate separates out. The precipitate is then collected on a Gooch filter, dried at 110° C., and weighed. When the soil contained less than 20 parts per million of nitric nitrogen it was found desirable previously to concentrate the soil extract by evaporation with the addition of a little sodium hydroxid or calcined magnesia.

In the determination of nitric acid in mustard 20 gm. of the dried and fine-ground plant was extracted with 400 gm. of water which was slightly warmed.

A part of the extract was then acidified with acetic acid, the solution filtered, and nitrate precipitated with the nitron solution.

The method was compared with other standard methods of determining nitric acid, such as the Schloesing and the Schulze-Tiemann methods, under varying conditions. The materials examined included compost earth, field soils, and mustard, as already stated. The results show that the method will very accurately determine 2 to 3 mg. of nitrate nitrogen in 100 gm. of soil. In case of soils containing less than this amount of nitrate it is not possible to make accurate determinations on account of the fact that the repeated extraction necessary and the greater concentration required result in increase of substances in the solution which prevent the crystallization of the nitron nitrate. Substances which similarly interfere with the crystallization occur when soil extracts are sterilized by heat. The difficulty due to these substances can be removed by repeatedly adding hydrogen peroxid to the extract during evaporation and by heating the concentrated extract with hydrogen peroxid in boiling water for 6 hours until the color is destroyed. The determinations of nitrate in mustard indicate that the results heretofore obtained by other methods of determining nitrates in plants are often too high.

The determination of ammonia in water, A. Ronchèse (*Jour. Pharm. et Chim., 6. ser., 27 (1908), No. 5, pp. 231–235; Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 6, pp. 362–366*).—The author describes an adaptation of his formaldehyde method (E. S. R., 19, p. 407) to the determination of small amounts of ammonia in waters. He reports tests with water containing varying amounts of ammonia from which he concludes that the method is as exact as the more sensitive methods of determining ammonia in water, as, for example, that of Buisson.

A method for the determination of very small amounts of carbon, especially the carbon of organic substances, in water, N. Popowsky (*Arch. Hyg., 65 (1908), No. 1, pp. 1–16, figs. 2*).—The method with which this article deals is an adaptation of the wet combustion method perfected by Scholz in which the organic matter is converted to carbon dioxid by boiling with potassium bichromate and sulphuric acid. The carbon dioxid is measured by the decolorization of sodium-carbonate solution containing phenolphthalein, the carbon dioxid converting the carbonate to bicarbonate and thus destroying the color.

A new reaction for protein, B. Bardach (*Ztschr. Physiol. Chem., 54 (1908), No. 4, pp. 355–358*).—The presence of albumin hinders the formation of iodoform from iodin or iodid of potassium and acetone. The author studied the reaction with a number of different proteids and concludes that it not only may be useful for the detection of protein but also may be of value in judging of the nature of the proteid present.

Chemistry of flesh. Further studies on the application of Folin's creatin and creatinin method to meats and meat extracts, A. D. Emmett and H. S. Grindley (*Jour. Biol. Chem., 3 (1907), No. 6, pp. 491–516*).—On the basis of an extended chemical study of meat extracts and meats, conclusions were drawn regarding the applicability to such products of the Folin method of determining creatinin and creatin, and suggestions are made regarding details of manipulation, etc.

The authors conclude "that the Folin method when properly modified is as applicable to meat extracts and meats as it is to urine," and that it has given reliable and concordant results in their experience.

Concerning Liebig's meat extract, III, Kutscher (*Zentbl. Physiol., 21 (1907), No. 18, pp. 586, 587*).—A saturated alcoholic solution of cadmium chlorid has proved a useful reagent in the study of meat extract bases.

A trial of the polariscopic method for the determination of gliadin, G. W. SHAW (*Jour. Amer. Chem. Soc., 29 (1907), No. 12, pp. 1747–1750*).—From an experimental study of this method, the author is decidedly of the opinion that it is worthy of much more extended use and that if precautions are taken to make corrections for the effect of other optically active bodies there are fewer opportunities for error than with the ordinary methods of determining nitrogen.

"In our experience with the method it was always found necessary to make two polarization determinations, the first of the original solution, and the second after separating the protein bodies by the use of a concentrated solution of mercuric nitrate, and then making the required correction to give the true gliadin reading."

On the analytical estimation of gliadin, W. E. MATHEWSON (*Jour. Amer. Chem. Soc., 30 (1908), No. 1, pp. 74–81*).—In a comparison of different methods of extracting gliadin it was found that 8 to 17 per cent more nitrogenous matter was extracted when the proportion of material to solvent (cold 70 per cent alcohol) was 4 gm. to 100 cc. than when 4 times as much flour was used.

"After drying 6 hours in the water oven, 10 to 20 per cent less gliadin was obtained by extracting with cold solvent. With the hot water solvent the figures were nearly the same, being slightly lower. Pure gliadin remains soluble in dilute alcohol after the same treatment. No tendency for glutenin to remove gliadin from its alcoholic solutions by absorption or with the production of a solid solution could be demonstrated. Propyl alcohol of constant boiling point (70 per cent by weight) used in an extraction apparatus gave results probably no more accurate than the others. Anhydrous phenol dissolves a high percentage of protein matter from the flour. The dissolved matter is not pure gliadin, however, nor does it seem to consist of gliadin with but one other protein."

Experiments upon Barfoed's acid cupric acetate solution as a means of distinguishing glucose from maltose, lactose, and sucrose, F. C. HINKEL and H. C. SHERMAN (*Jour. Amer. Chem. Soc., 29 (1907), No. 12, pp. 1744–1747*).—In the authors' hands, this method gave good results, being efficient for the detection of 0.0004 gm. glucose, either alone or in the presence of maltose, lactose, or sucrose up to 0.02 gm.

"Reduction due to disaccharid occurs if too much either of sugar or of acid be present, or if the heating be too prolonged. In order to effect complete destruction of the glucose, so that the filtrate might be utilized in testing for maltose or lactose, it was necessary to limit the amount to about 0.002 gm. of glucose to 5 cc. of the reagent. It appears that the test requires very careful regulation as to details of manipulation and amount of sugar tested, but under such restrictions is capable of greater usefulness than has generally been appreciated. . . .

"On account of the difficulty of securing an exact degree of acidity in the cupric-acetate solution, each chemist should demonstrate the efficiency of his reagent, as well as verify his manipulation, by check experiments upon known sugar solutions covering the probable range of composition of the unknown solutions to be tested."

The estimation of starch in potatoes by means of specific gravity, FOTH (*Ztschr. Spiritusindus., 30 (1907), No. 21; abs. in Bul. Assoc. Chim. Sucr. et Distill., 25 (1908), No. 7, pp. 691, 692*).—A modified method of estimating the starch content of potatoes from their specific gravity is proposed.

A new method of determining the water which flour will absorb, J. F. HOFFMANN and R. PLOETZ (*Ztschr. Spiritusindus., 31 (1908), No. 5, pp. 42, 43*).—In the method described the sample, after wetting with water, is pressed

between 2 porcelain slabs. A mathematical formula is proposed for use in calculating from measured data the power of flour to absorb water.

Microscopical examination of wheat flour, especially for the detection of rice and bean flour, J. Bellier (*Ann. Chim. Analyt., 12 (1907), No. 6, pp. 224–228*).—The data reported have to do with the characteristics of different sorts of flour examined with a microscope and are discussed with special reference to the detection of adulteration of wheat flour.

Adulteration of chocolate with potato starch, A. Paladino-Blandini (*Naples, 1907, pp. 3; separate from Gaz. Internaz. Med., 10, 1907*).—The data reported have to do with the detection of potato starch in chocolate.

Concerning the acid content of honey, Utz (*Pharm. Post, 41 (1908), Nos. 6, pp. 69, 70; 7, pp. 81–83*).—The author determined the acid content of 175 samples of honey, most of them of German origin. He found that the acid content, expressed as formic acid, varied decidedly from the values given in the literature of the subject, ranging in the samples analyzed from 0.0644 to 0.3312 per cent. He also concludes that heating honey on a water bath diminishes the amount of free acid present and that this loss is more noticeable if the honey is heated over a free flame.

Concerning the mineral matter in honey, Utz (*Ztschr. Angew. Chem., 20 (1907), No. 51, pp. 2222–2225; 21 (1908), No. 17, pp. 780–781*).—Examination of 131 samples of German honey from different regions showed a range of 0.013 to 0.703 per cent, the mean average value being 0.358 per cent ash. Eighteen samples of honey from other regions contained from 0.051 to 0.306 per cent.

Concerning the mineral matter in honey, F. Schwarz (*Ztschr. Angew. Chem., 21 (1908), No. 10, pp. 436–439*).—The author does not agree with Utz's conclusion regarding the ash content of honey (see above). Basing his conclusions upon the examination of 374 samples he believes that the ash content of pure honey is not less than 0.1 per cent and that when it falls below this value the material is either adulterated or very suspicious. In his opinion, determining the ash content is an important method of judging of the purity of honey.

Biological method for determining the presence of horse meat, Weidanz (*Ztschr. Fleisch u. Milchhyg., 18 (1907), No. 3, pp. 73–78*).—On the basis of investigation, the author concludes that the biological method gives satisfactory results.

A practical method for the detection of beef fat in lard, J. A. Emery (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 132, pp. 9*).—The method described consists in determining the melting point of the solid glycerids of the sample, obtained by crystallization from ether. It depends on the fact that although under like conditions of crystallization there is a uniformity in such value for lard, and also in that for beef tallow or oleostearin, the melting point is lower for the latter than for the former, and for a mixture of the two lies somewhere between the values for the pure fats. The technique of the method and the determination of the melting point are described, possible sources of error are mentioned, and some results of the practical application of the method are given.

In conclusion the author states that the method "has afforded very good results both in his hands and in those of a number of his coworkers and is considerably shorter than the method proposed by Leys.

"The application of both of these methods has proven efficient in detecting added beef in samples of suspected 'pork sausage.' The fat was obtained by subjecting the meat to a temperature of 125° C., and then pouring off and filtering the separated melted fat.

"In samples in which the amount of fat as obtained in this manner was not sufficient, extraction of the fat from the water-free finely minced product by means of ether and evaporation of the solvent was necessary. The subsequent procedure was then carried out as described in the method given.

"Finally it may be said that when the crystallized glycerids of any questionable sample of lard examined by the method described in this paper show a melting point below 63.4° C., the presence of beef fat should be suspected, while a melting point of 63° C., or below, can be regarded as positive evidence that the sample under examination contains beef fat as an adulterant."

The application to solid fats of Renard's test for peanut oil, W. B. SMITH (*Jour. Amer. Chem. Soc., 29 (1907), No. 12, pp. 1756, 1757*).—The results obtained show "that the addition of fats containing large percentages of solid fatty acids to cotton-seed oil or other oils interferes materially with the detection of peanut oil by this method, and in case the presence of peanut oil is suspected in such mixtures, some modifications of the method will be necessary to detect it; either to increase the proportion of 90 per cent alcohol used, which would be objectionable, or to recrystallize the 'arachidic acid' until a melting point higher than that of stearic acid is obtained, when the presence of arachidic acid is established."

The determination of sulphites in wine, C. MENSIO (*Gaz. Chim. Ital., 37 (1907), II, No. 4, pp. 344–355*).—A study of methods.

Examining and judging pepper, F. HÄRTEL and R. WILL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 9, pp. 567–579*).—The analytical and other data reported and discussed have to do with the detection of adulteration in pepper. According to the authors' results, the largest amount of ash permissible under the German pure food regulations, 7 per cent, is too high. They consider that a reduction to at least 6.5 per cent is desirable.

Ginger and extract of ginger, R. REICH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 9, pp. 549–567*).—According to the author's observations the quality of ginger may be learned by determining the volatile and nonvolatile ether extract, the alcohol extract by the Winton method, the alcohol extract after extraction with ether, the petroleum ether and methyl alcohol extract, total ash and sand-free ash, and the sand-free mineral matters insoluble in water. Characteristic differences in various sorts of ginger are pointed out and discussed.

The examination of marzipan and marzipan goods, F. HÄRTEL and P. HASE (*Pharm. Zentralhalle, 48 (1907), No. 50, pp. 1029–1035*).—From the considerable amount of analytical data which is reported, the author concludes that the determination of the water, fat, and sugar, and under some conditions the mineral matter, is essential for judging of the quality of such goods. The use of sweet apricot pits in place of almonds and other questions are also considered with special reference to pure-food laws.

A simple mechanical method for the estimation of casein in cows' milk, E. B. HART (*Wisconsin Sta. Rpt. 1907, pp. 117–133, figs. 3*).—The substance of this article has been noted from Bulletin 156 of the station (E. S. R., 19, p. 707).

Application of the reductase test in judging the hygienic characteristics of milk, C. BARTHEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 7, pp. 385–403*).—According to the results of investigations reported, testing the reductase action of milk upon the methylene-blue solution used in the Schardinger reaction may be employed as a means of judging the quality of milk.

To 10 cc. of milk 0.5 cc. of methylene-blue solution is added, the mixture is covered with a few drops of liquid paraffin and placed in a water bath at 40 to 45° C. If the color disappears in a few minutes the milk contains 100,000,000 or more bacteria per cubic centimeter. Even when the color continues

for about an hour the milk must be considered as too impure for food, especially for infants. Milk in which the color disappears within 3 hours is of inferior quality, but that requiring more than 3 hours is good market milk. The test should be made in duplicate.

A very simple means of distinguishing between cooked milk and raw milk, L. Gaucher (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 6, pp. 275, 276*).—A small sample (20 cc.) of milk is colored with 20 drops of a 1 per cent solution of hematein and shaken. If the milk is raw the rose color remains, but if it has been boiled the color quickly fades.

Pentoses in feces and their estimation, A. Jolles (*München. Med. Wchnschr., 55 (1908), No. 3, pp. 117–120*).—In this article, which discusses the pathological occurrence of pentoses, data are supplied regarding the relation of pentoses to different diets.

Miscellaneous chemical analyses, F. W. Woll and G. A. Olson (*Wisconsin Sta. Rpt. 1907, pp. 160–164, 167–170*).—Among the analyses reported are those of a Cheddar cheese 4 years old, skim-milk cheese, salty milk, human milk, and factory by-products.

A new apparatus for determining the condensing power of soils for ammonia, G. Rösing (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 2, pp. 123–127, fig. 1; abs. in Chem. Abs., 2 (1908), No. 11, pp. 1586, 1587*).—A modification by Remy of the apparatus described by Wohltmann and Schneider (E. S. R., 17, p. 537) is described and tests of it on a number of samples of soil are reported. The modification provides for equalization of pressure in the apparatus before and after absorption of the ammonia and thus insures accuracy of measurement.

Determination of the heat of combustion of organic compounds by use of the platinum resistance thermometer, E. Fischer and F. Wrede (*Sitzber. K. Preuss. Akad. Wiss., 1908, No. 5, pp. 129–146; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 545, II, p. 155*).—More accurate results are claimed from the use of a platinum resistance thermometer in place of the mercury thermometer. Values for the heats of combustion of sucrose and benzoic acid are given as 3.954 and 6.328 large calories per gram, respectively.

METEOROLOGY—WATER.

Note on some meteorological uses of the polariscope, L. Bell (*Proc. Amer. Acad. Arts and Sci., 43 (1908), No. 15, pp. 407–412, fig. 1*).—An account is here given of some preliminary observations with a Savart polariscope at the base of Mount Moosilauke, N. H., at an elevation of 1,650 ft., from which the conclusion is drawn that such observations give "a most instructive view of the very early stages of atmospheric nucleation, and especially if combined with rainband observations should have material prognostic value as regards comparatively local conditions."

Equivalent temperature as a unit expression of the climatic factors, air temperature, and atmospheric humidity, W. Knoche and J. Hann (*Met. Ztschr., 24 (1907), Nos. 10, pp. 433–444, figs. 7; 11, pp. 501–504*).—Knoche calculates the equivalent temperature as well as its yearly and daily variations for various climates, and discusses the value of this unit as a combined expression of air temperature and humidity. As defined by von Bezold equivalent temperature is the heat measured by the thermometer plus the latent heat of the aqueous vapor in the air. J. Hann in reviewing Knoche's article asserts that equivalent temperature is of no value as a unit expression for air temperature and humidity, as a climatic factor, or as a factor in the heat economy of man or organisms in general; that is, it is of no biological importance.

The relation of meteorology to horticulture, R. H. Curtis (*Jour. Roy. Hort. Soc. [London], 33 (1908), No. 1, pp. 12–19*).—This is a continuation of a previous article and deals chiefly with atmospheric moisture, particularly the amount, distribution, and character of the rainfall in relation to plant growth.

The development of the German weather service during 1907, Börnstein (*Jahrb. Dent. Landw. Gesell., 22 (1907), No. 4, pp. 761–764*).—This is a brief statement regarding the value of this service to farmers.

The weather of the summer of 1907 in Germany and its influence on the agricultural industry, Kassner and Hillman (*Jahrb. Dent. Landw. Gesell., 22 (1907), No. 4, pp. 765–778, pls. 4*).—The season of 1907 is briefly discussed from the meteorological standpoint as well as with reference to its influence on the agricultural industry.

Climate [of Belgium], (*Exposé de la Situation du Royaume de 1876 à 1900. Brussels: Gort., 1907, vol. 1, pp. 55–84*).—The general climatic conditions are described and meteorological observations which have been made since the establishment of the observatory of Brussels in 1833 are summarized.

Contributions to the study of the meteorology of Cape Verde, J. M. de Macedo (*Rev. Off Missão Agron. Cabo Verde, 1 (1908), Nos. 1, pp. 19–24; 2, pp. 48–51; 3, pp. 85–88*).—The meteorological conditions during 1905–1907 are briefly summarized.

Studies on the climate of Tunis, G. Ginestous (*Études sur le climat de la Tunisie. Tunis, 1906, pp. 428+XI, illus.; rev. in Bul. Dir. Agr. Com. et Colon. [Tunis], 11 (1907), No. 45, p. 577*).—This is a thesis presented for a doctor's degree at the University of Paris. It reviews previous publications on the climate of Tunis and summarizes and discusses the meteorological data obtained at the various stations of the meteorological service of Tunis during more than 20 years. The work is in three parts, (1) general character of the climate of Tunis, (2) study of the climate of Tunis, and (3) natural climatic regions of Tunis.

The climate of São Paulo, Brazil, F. T. de Souza Reis (*Lavoura; Bol. Soc. Nac. Agr. [Brazil], 11 (1907), No. 9, pp. 393–399*).—This is a brief review of the principal meteorological elements for this region.

Lakes and forests as climatic factors, J. Schubert (*Geogr. Ztschr., 13 (1907), No. 12, pp. 688–694, fig. 1*).—Observations bearing on this subject are reviewed with an attempt to explain the climatic influence exerted by lakes and forests.

A new theory of formation of underground water, G. Martinet (*Chron. Agr. Vaud, 21 (1908), No. 1, pp. 13–16*).—The author agrees with Haedicke that in many cases at least atmospheric precipitation is not sufficient to maintain the underground supply of water, and that in such cases the supply is maintained more largely by absorption of aqueous vapor from the air than from precipitation.

Iron in subterranean waters, H. Schwers (*Rev. Hyg. et Pol. Sanit., 30 (1908), Nos. 1, pp. 11–43, fig. 1; 2, pp. 100–126, figs. 8; 3, pp. 185–221; 4, pp. 287–306*).—This is a rather comprehensive discussion of this subject divided into general and special parts. The first part deals with the nature of iron compounds in subterranean waters, the conditions which cause their solution, and the processes of removal of the iron. The second part deals particularly with a study of natural ferruginous deposits (ochers), and tests of methods of removing iron, with practical conclusions arrived at.

Water-supply investigations in Alaska, 1906–7, F. F. Henshaw and C. C. Covert (*U. S. Geol. Survey, Water-Supply Paper 218, pp. 156, pls. 12, figs. 2*).—This report gives the results of stream measurements in the Nome and Kougarok regions of the Seward Peninsula, and the Fairbanks district of the Yukon-Tanana region, as well as meteorological records (rainfall, temperature, and

pressure) for Seward Peninsula and the Fairbanks district during 1906–7, and a summary of observations on precipitation throughout Alaska from 1902 to 1907, inclusive.

Nitrates, nitrites, and ammonia in sea water, W. E. Ringer and I. M. P. Klingen (*Chem. Weekbl., 5 (1908), No. 10, pp. 147–168*).—Previous investigations on this subject are reviewed, and the results of tests by very refined methods of numerous samples of sea water are reported, showing in different cases considerable amounts of the three forms of nitrogen.

The fertilizing value of snow, F. T. Shutt (*Trans. Roy. Soc. Canada, 3. ser., 1 (1907–8), Sec. III, pp. 35–38; Chem. News, 97 (1908), No. 2530, pp. 243, 244*).—Determinations of free and albuminoid ammonia, nitrates, and nitrites in snow collected on the Central Experimental Farm of Canada at intervals from February 21 to May 4, 1907, are reported.

The results show wide fluctuations in the nitrogen content of the samples, but the average for the total nitrogen was 0.471 part per million, of which 0.256 was free ammonia, 0.052 albuminoid ammonia, and 0.163 nitrates and nitrites. It is calculated that with an average snowfall of 90 in. approximately 1 lb. of nitrogen would be supplied to the soil per acre during a season.

On the purification of peaty waters by freezing, F. T. Shutt (*Trans. Roy. Soc. Canada, 3. ser., 1 (1907–8), Sec. III, pp. 31–33*).—Analyses of 2 samples of river water containing considerable amounts of peaty matter are compared with analyses of ice from the same source. The results show that in freezing a very large proportion of the dissolved organic matter was eliminated. The amount of chlorin was also reduced and the mineral matter was entirely eliminated.

On natural filtration of soils, W. Prausnitz (*Ztschr. Hyg. u. Infektionskrank., 59 (1908), pp. 161–224, pl. 1, figs. 10*).—This article gives the results of a large number of observations on the removal of disease germs from waters percolating through soils.

SOILS—FERTILIZERS.

Preliminary report on the agricultural geology of Nebraska, G. E. Condra and A. Keyser (*Ann. Rpt. Nebr. Bd. Agr., 1906–7, pp. 325–350, figs. 7*).—This paper supplements previous articles by E. H. Barbour (E. S. R., 14, p. 646) summarizing the results of a study of the geography and geology of the State in connection with the State and National geological and soil surveys. It briefly describes the climatic, topographic, and geological conditions of the State, as well as soils, drainage, and water supply. Four typical soil areas are distinguished, namely, the loess, sand hill, high plains, and bad land regions. The predominant soil types are Marshall silt loam, Miami silt loam, Marshall fine sandy loam, Marshall loam, Wabash silt loam, meadow, river wash, and dune sand. The agricultural adaptabilities of the different soil areas are briefly discussed.

Drainage conditions in Wisconsin, A. R. Whitson and E. R. Jones (*Wisconsin Sta. Rpt. 1907, pp. 286, 287*).—This is a synopsis of Bulletin 146 of the station (E. S. R., 19, p. 87).

The required capacity of open drainage ditches, E. R. Jones (*Wisconsin Sta. Rpt. 1907, pp. 288–293, fig. 1*).—Observations on rainfall and run-off in a typical marsh land district of the State are recorded.

Some field studies in tile drainage, E. R. Jones and W. C. Schroeder (*Wisconsin Sta. Rpt. 1907, pp. 294–301*).—This is a record of observations in Milwaukee and Racine counties on the extent, methods, and advantages of tile drainage.

Studies on some soils from Saskatchewan, L. L. Clark, R. A. Gortner, and C. E. Vail (*Amer. Chem. Jour., 39 (1908), No. 2, pp. 163–165*).—Analyses of samples of a bowlder clay from southern Saskatchewan to show the vertical distribution of soluble salts in the soil, the composition of the water-soluble portion of the soil, and the chemical composition of the soil particles of different sizes (sand, coarse silt, fine silt, clay) are reported. There was in all cases a steady decline in soluble salts from the first to the sixth foot. The principal constituents of the water-soluble material were sodium, magnesium, sulphuric acid, and chlorin. The percentage of lime was smallest in the clay particles and largest in the coarse silt. The percentage of iron and alumina, potash, and phosphoric acid increased steadily from the sand to the clay.

Soil surveys and agricultural maps in foreign countries and in Denmark, K. Rördam (*Tidsskr. Landökonom., 1907, Nos. 10, pp. 537–563, figs. 4; 11, pp. 608–616*).—An address delivered before the Danish Royal Agricultural Society, February 20, 1907, with discussion of the same. Soil survey work in Denmark, Scandinavia, Germany, Belgium, France, and England is referred to.

Twenty-five years' work of the German Moor Culture Association, Wangenheim and M. Fleischer (*Illus. Landw. Ztg., 28 (1908), Nos. 14, p. 111, figs. 3, map 1; 15, pp. 123, 124*).—Brief reviews of the work of this organization are given, with a map showing the distribution of moor lands in Germany.

The Swedish Moor Culture Association and the Flahult moors, L. Grandeau (*Jour. Agr. Prat., n. ser., 14 (1907), Nos. 47, pp. 649–653, figs. 2; 48, pp. 680–684, figs. 3; 49, pp. 713–716, figs. 2; 50, pp. 745–747; 51, pp. 777–780, fig. 1; 52, pp. 808–810*).—This is a statement regarding the work of this association and an account of a visit to the moor culture station at Flahult, with descriptions of the work in progress there.

First principles of soil fertility, A. Vivian (*New York, 1908, pp. 265, figs. 93; rev. in Amer. Agr., 81 (1908), No. 6, p. 150*).—It is stated that this book is intended primarily for home reading, but since it is made up largely from lecture notes used by the author in a course in soil fertility it is believed that it will be found a suitable text for short courses. It is written in nontechnical language with free use of illustrations. The subjects treated include the atmosphere and soil as sources of plant food, nitrogen as a plant food, origin of the soil, tillage, drainage and irrigation, summer fallowing, humus and green manuring, rotation of crops, manure and its preservation and application, relation of barnyard manure to the maintenance of fertility, nature and use of commercial fertilizers, purchase of fertilizers, and indirect fertilizers.

The productiveness of the soil: Chemical factors, J. Graftiau (*Ann. Gembloux, 18 (1908), No. 2, pp. 89–107, figs. 2*).—This is a general discussion of the chemical factors of soil fertility intended to supplement a previous article by Grégoire on physical properties of soils in their relation to productiveness (E. S. R., 19, p. 1015).

The influence of various salt solutions on the permeability of soils, D. J. Hissink (*Chem. Weekbl., 4 (1907), pp. 663–673; abs. in Chem. Zentbl., 1907, II, No. 26, pp. 2071, 2072, fig. 1; Jour. Chem. Soc. [London], 92 (1907), No. 542, II, p. 984*).—The results of percolation experiments with water, sodium chlorid, potassium chlorid, ammonium chlorid, and calcium chlorid solutions through soil in cylinders are reported. With distilled water and solutions of sodium and potassium chlorids the permeability of the soil was decreased; when treated with solutions of ammonium and potassium chlorids the permeability was increased at first, but finally decreased.

Nitrogen content of soils as affected by methods of farming, A. R. Whitson, C. W. Stoddart, and A. F. McLeod (*Wisconsin Sta. Rpt. 1907, pp. 254–262*).—This article reports a continuation of observations begun in 1906 (E. S.

R., 18, p. 1025) on the changes in the nitrogen content of a number of clay loam soils under the influence of continuous cropping in a general system of farm management. Determinations of nitrogen in the cropped soil and in similar virgin soil are reported.

The results show in general that the largest loss of nitrogen has occurred in those soils which ordinarily contain a rather large percentage of nitrogen. In 16 out of 21 cases in which the virgin soil contained 0.2 per cent of nitrogen or over the loss of nitrogen above that removed by crops, probably due chiefly to denitrification and leaching, exceeded 500 lbs. per acre. In 21 out of 26 cases in which the virgin soil contained less than 0.2 per cent of nitrogen the loss of nitrogen was less than 500 lbs. per acre. The average losses were 29.6 per cent of that removed by crops in 1907 and 22.3 per cent in 1906. The loss of nitrogen above that removed by crops was greater when the soil was manured than when no manure was applied. "This seems to indicate that the nitrogen added in the form of manure, as ordinarily applied, does not accumulate in the soil, and suggests the desirability of a very careful study of the methods of applying farmyard manure to determine whether it should be applied in very small quantities annually, or larger amounts at intervals of 4 to 6 years, as is the customary practice."

The feeding of plants by the free living nitrogen-fixing bacteria of the soil, A. Koch et al. (*Jour. Landw., 55 (1907), No. 4, pp. 355–416, pls. 3; abs. in Deut. Landw. Presse, 35 (1908), No. 6, p. 57; Chem. Zentbl., 1908, I, No. 5, pp. 480, 481; Jour. Chem. Soc. [London], 94 (1908), No. 543, II, pp. 56, 57; Jour. Soc. Chem. Indus., 27 (1908), No. 9, p. 459; Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 13–14, pp. 435–437*).—These investigations have been reviewed from another source (E. S. R., 19, p. 318).

On fixation of nitrogen in cultivated soils, H. Warmbold (*Centbl. Bakt. [etc.], 2. Abt., 20 (1907), No. 4–5, pp. 121–126*).—This is a reply to criticism by Pfeiffer and his collaborators (E. S. R., 18, p. 617) of a previous article by the author, in which data were reported indicating a chemical fixation of nitrogen in sterilized soils. In further experiments with the same samples of soils no gain was observed under such conditions. On the other hand, a decrease in percentage of total nitrogen was observed in all cases. The extent to which these apparent gains or losses are due to analytical errors is discussed.

Fixation of nitrogen by certain hyphomycetes living in dead plants, H. Froehlich (*Jahrb. Wiss. Bot. [Pringsheim], 45 (1907), No. 2, pp. 256–302, figs. 3*).—Studies of nitrogen fixation in pure cultures of *Alternaria tenuis, Macrosporium commune, Hormodendron cladosporioides,* and *Cladosporium herbarum,* derived from dead stems and leaves of various trees and herbaceous plants are reported which showed that these organisms, which occur widely distributed in plant remains, can grow normally on substrata to which no nitrogen compounds have been intentionally added. Careful determination of the nitrogen balance indicates that all four of the organisms assimilate free nitrogen from the air.

Under the cultural conditions of these experiments the relative rates of fixation per 100 cc. of culture solution were as follows: *M. commune* 3.70 mg. of nitrogen, *A. tenuis* 3.34 mg., *C. herbarum* 2.26 mg., and *H. cladosporioides* 1.93 mg. The period covered by the different experiments varied from 39 to 42 days. The maximum nitrogen increase observed was 4.5 mg. in a culture of Macrosporium, the smallest, 1.16 mg., in a culture of Hormodendron. The nitrogen content of the dry matter produced (100 to 200 mg.) was relatively low, but varied with the different cultures. In general it was somewhat less than 1 per cent. All of the organisms required oxygen for their growth and are obligate aerobic organisms. Hormodendron and Cladosporium were able to grow at

temperatures of from 0 to 10°. Dextrose was found to be the most suitable source of carbon. Fermentation processes were not observed in case of any of the organisms. The amount of nitrogen fixed per gram of dextrose assimilated was greater in all cases than with *Clostridium pasteurianum*, being on the average as follows: *M. commune* 8.92 mg., *A. tenuis* 5.02 mg., *C. herbarum* 4.38 mg., and *H. cladosporioides* 2.56 mg.

Incidentally the conclusions of other investigators that *Aspergillus niger* and *Penicillium glaucum* are capable of fixing free nitrogen were confirmed. It was also shown in the culture experiments reported that *Hormodendron cladosporioides* and *Cladosporium herbarum* are two entirely distinct forms and not, as has been often claimed, identical organisms.

On the adaptability of different sources of energy to assimilation of atmospheric nitrogen and the distribution of nitrogen-fixing bacteria in the soil, II. PRINGSHEIM (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 8–9, pp. 248–256*).—In the investigations reported in this article the power of various Clostridia, but especially *Clostridium americanum*, to assimilate the carbon of cane sugar, starch, milk sugar, and ammonite under different conditions of concentration, etc., was studied. It was found that these carbohydrates were about as efficient as grape sugar as sources of energy in the fixation of nitrogen by *C. americanum*. With concentrations varying from 0.5 to 4 per cent it was found that the utilization of the energy-producing materials was best with the lower concentration. *C. americanum* utilized the different sources of energy more completely than *C. pasteurianum*. The addition of iron salts to the culture solutions did not increase the nitrogen-fixing capacity of the first-named organism.

The fixation of nitrogen by Rhizobium leguminosarum, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales, 31 (1906), pt. 4, pp. 608–615*).—A study of the production of slime in continuation of earlier work (E. S. R., 19, p. 518) and the fixation of nitrogen by Rhizobium from Robinia or lupine alone or in association with *Bacillus levaniformans*, *B. radiobacter*, and Azotobacter on culture media containing no asparagin or other nitrogenous substance, showed that different races of the Rhizobium can fix atmospheric nitrogen under such conditions and that the fixation is coincident with and proportional to the formation of slime. "Under conditions that preclude the formation of slime, there is no fixation. Conditions, such as the presence of another bacterium, which assist the formation of slime, also assist fixation. It is a matter of indifference whether the medium is acid or alkaline."

The author's studies on the structure of Rhizobium indicate that it is a compound micro-organism of coccus type (leuconostoc or streptococcus-like) and his observations on the fixation of nitrogen by the organism confirm and amplify the results obtained by Mazé. The author believes that the slime produced by this organism contains gum and a soluble albuminous constituent which is assimilable by plants and thus makes the plant independent of the supply of soil nitrogen under certain conditions, as for example, in nitrogen-free soils.

"We are now certain of the kind of help which the bacterium gives the plant. There exists a symbiosis; the plant supplies saline and saccharine matter, the latter of which the bacterium converts into gum and at the same time elaborates atmospheric nitrogen into constituents which are partly contained within the bacterial cell and partly diffused in the gum, which by virtue of their presence appears as a slime. Both the nitrogenous and the carbohydrate constituents of the slime are then elaborated by the plant cells into tissue elements."

The fixation of nitrogen by Azotobacter chroococcum, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales, 31 (1906), pt. 4, pp. 616–618*).—The slime pro-

duction and nitrogen fixation of various organisms obtained in the process of isolating *Rhizobium leguminosarum* from a nodule of the blue lupine are briefly reported upon in this article. The organisms experimented with were *A. chroococcum*, *Bacillus radiobacter*, and *B. levaniformans* singly and in various combinations. "The experiment bears out Beijerinck's and Van Delden's results, that the fixation of nitrogen by these bacteria is chiefly, if not entirely, due to *A. chroococcum;* and . . . indicates that the combination of bacteria brings about a quicker and more regular fixation."

A biological method for the determination of alkali carbonates in soils, H. R. Christensen (*Tidsskr. Landbr. Planteavl, 14 (1907), pp. 292–294; Centbl. Bakt.* [*etc.*], *2. Abt., 19 (1907), No. 21–23, pp. 735, 736; abs. in Chem. Zentbl., 1908, I, No. 2, pp. 166, 167*).—This is a preliminary report of investigations in continuation of previous experiments which led to the conclusion that lime in the form of gypsum, calcium chlorid, and tricalcium phosphate can not be utilized by Azotobacter (E. S. R., 18, p. 720).

The later investigations do not bear out this conclusion, but show that in certain soils there is no growth with these salts, in others a limited growth, and in still others as vigorous growth with these salts as with calcium carbonate. This difference in behavior of soils is attributed to the presence in certain of them of substances which are able to convert a small amount of the lime into form suitable for assimilation by Azotobacter.

Experiments are reported which show that alkali carbonates are capable of bringing about such changes, and it is suggested that the growth of Azotobacter in soils supplied with gypsum may be utilized as a measure of their content of alkali carbonates.

The new nitragin, J. Vogel (*Illus. Landw. Ztg., 27 (1907), No 2, pp. 5, 6; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 20 (1907), No. 6–7, p. 175*).—This article reviews the progress in the practical application of pure cultures for soil inoculation, especially with the improved Hiltner cultures. It is stated that it has been demonstrated that Hiltner's cultures and methods of inoculation give in many cases results of great practical importance. Of 62 tests of pure cultures for serradella reported in 1905, 85 per cent gave beneficial results. Large numbers of cultures for yellow and blue lupines, peas, vetches, and beans were also distributed.

Inoculation as a factor in growing alfalfa, H. A. Harding and J. K. Wilson (*New York State Sta. Bul. 300, pp. 137–164, figs. 2, map 1*).—This bulletin gives the results of experiments on 67 farms in 33 different counties of the State to test the need and most effective means of inoculation for alfalfa.

"The bacteria, *Pseudomonas radicicola*, which enable alfalfa to obtain nitrogen from the air were present, at least in small numbers, in practically all of the 67 experimental fields. They were present in sufficient numbers to produce an inoculation in any considerable number of the young alfalfa plants in only one-third of these fields. An attempt to supply the germs by applying pure cultures of *P. radicicola* to the seed, drying, and sowing, resulted in almost complete failure. Applying soil from an old alfalfa field at the rate of 150 to 300 lbs. per acre invariably produced an abundant inoculation on these experimental fields.

"While but 15 of the 67 experimental plats produced a successful crop without inoculation, 48 adjacent plats where inoculating soil had been applied produced successful crops. Accordingly, alfalfa growing, on 33 of the 67 fields which were tested, was changed from a failure to a success by the application of inoculating soil."

Alfalfa aided by soil inoculation, F. H. Hall (*New York State Sta. Bul. 300, popular ed., pp. 10*).—A popular edition of the above.

How to determine the fertilizer requirements of Ohio soils, C. E. Thorne (*Ohio Sta. Circ. 79, pp. 23, map 1*).—This circular explains the laboratory, pot culture, and field experiment methods of studying the fertilizer requirements of soils, the conclusion being that field experiments furnish the only safe guide for this purpose. The methods of conducting such experiments and of drawing conclusions from the results obtained are explained in detail.

Report on cooperative field experiments in Jutland, 1906 (*Beretning om Lokale Markforsög og Forevisningsmarker i Landboforeningerne i Jylland 1906. Aarhus, 1907, pp. 351, figs. 24*).—The report covers a large amount of field experimentation conducted by farmers' clubs in different parts of Jutland during 1906. Seven hundred and twenty-four different fertilizer trials with winter and spring grains, roots, and hay crops were made, as well as 344 trials with farm crops, variety tests, methods of planting or culture, green manuring, etc., making a total of 1,068 different trials for the year. Detailed information is given in each case as to cultural conditions, fertilizers applied, and results obtained. Data are also given as to economy of the fertilization in each case.

Superphosphate and sodium nitrate produced the best results in case of all crops, except the root crops, with which this combination of fertilizers came second, and sodium nitrate alone first; the complete fertilizer, on the other hand, came third or fourth, potash with one or the other of the ingredients producing the poorest results, and in the case of all the crops, except the mangels, generally at an actual loss. It is suggested that the poor showing of the potash fertilizers may have been partly due to their rather late spring application.

As a general rule, the best and most certain results from the applications of the various fertilizers were obtained with the winter grains and the least certain returns with the spring grains. Owing to the dry September the root crops did not respond to the fertilizers applied in as marked manner as usual. There was considerable uncertainty in the after-effects of the fertilizers on the first-year clover and grass meadow, but many striking examples were obtained showing that it pays to apply potash and phosphates, even if only the total increase in the hay crop is taken into consideration. There was, however, a marked improvement in most cases in the quality of the hay due to an increased growth of leguminous plants and good grasses.

In 158 other field trials tests were made of the adaptability of different regions to a profitable culture of alfalfa; time and method of application of sodium nitrate; distribution and harrowing in of potash salt and superphosphates; different phosphatic fertilizers; lime niter *v.* sodium nitrate; "Kultura" phosphate, marl, and lime; green manuring; barnyard manure and liquid manure; time of sowing spring grains; time of thinning mangels; gray and yellow oats; variety tests of oats, barley, rye, potatoes, and turnips; alfalfa experiments; culture of peas, grown alone and in mixtures; maize for green feeding; crop rotations on sandy soils; picking of mangel leaves; grading of seed oats; cultivation tests; grass-seed mixtures; and prevention of club-root disease.

Cooperative fertilizer trials in Malmöhus County, 1906, M. Weibull, G. Nordin, and G. Thomé (*Malmö. Läns K. Hushåll. Sällsk. Kvrtlsskr., 1907, No. 1, pp. 197–265*).—The trials were conducted in the same manner and along similar lines as during the preceding year. The following special investigations were conducted and are reported in this publication: The best potash fertilization for fodder beets, ruta-bagas, and barley, being comparisons between 37 per cent potash salt and kainit, in which Wagner's results (E. S. R., 16, p. 861) were, in general, corroborated; trials with calcium cyanamid *v.* lime niter for potatoes and sugar beets, showing that the nitrogen in these fertilizers is of equal value; ammonium sulphate *v.* sodium nitrate for potatoes on sandy

soils, in which the former produced 15 per cent higher yields than the latter at a considerably lower cost; and further trials of the effect of artificial fertilizers on the quality of potatoes and root crops. The results of cooperative fertilizer trials similar to those of earlier years on meadows, small grains, peas, potatoes, and root crops are also reported.

The value of the Albert plant food salts for pot cultures, K. Brehmer (*Gartenwelt, 12 (1908), No. 17, pp. 193–197, figs. 9*).—Experiments, mainly with a number of ornamental plants, are reported in which various combinations of these salts were used in solution and also in solid form. The best results were as a rule obtained by two applications per week of 1 gm. each per pot of a solution of mixed salts containing from 6.5 to 12 per cent of phosphoric acid, 13 to 15 per cent of nitrogen, and 3.5 to 11 per cent of potash.

Further experiments with various kinds of nitrate, J. Sebelien (*Jour. Landw., 55 (1907), No. 4, pp. 293–297; abs. in Chem. Zentbl., 1908, 1, No. 3, p. 286; Jour. Chem. Soc. [London], 94 (1908), No. 543, II, p. 61*).—Pot experiments with mustard in 1905 having shown that excessive applications of nitrate of soda slightly depressed the yield while similar applications of basic lime nitrate showed no such injurious effects, pot experiments with still larger applications of basic lime nitrate and sodium nitrate, as well as of "sulphate-nitrate," a mixture of calcium nitrate with ammonium sulphate, were made with the same crop grown in sand in 1906.

The results show that the yields were five times as great with the basic lime nitrate and the sulphate-nitrate mixture as with sodium nitrate.

In similar experiments with oats grown in sand and soil of good quality the basic lime nitrate and sodium nitrate gave equally good results.

It is stated that the object of mixing calcium nitrate with ammonium sulphate is to avoid difficulty in the use of the nitrate due to its deliquescence. The mixing of the two substances results in a recombination producing ammonium nitrate and gypsum.

Should lime nitrogen be applied at the time of seeding and can it be used as a top dressing in spring? A. Stutzer (*Deut. Landw. Presse, 35 (1908), No. 7, p. 65*).—The author criticises adversely the method used by Müntz and Nottin (E. S. R., 19, p. 320) in experiments with lime nitrogen from which they concluded that the germination of seeds is not interfered with by applications of not more than 89 lbs. of calcium cyanamid per acre, and that top-dressing at this rate will give good results. The opinion is expressed that the more carefully controlled investigations of others show that injurious results are very likely to follow the use of calcium cyanamid in the manner indicated.

Citric-acid-soluble phosphoric acid in phosphatic slags, M. de Molinari and O. Ligot (*Bul. Agr. [Brussels], 23 (1907), No. 12, pp. 911–918, figs. 5*).—The authors report here a continuation during 1907 of pot experiments with oats, barley, and spring wheat grown on loam and sandy soils to test the fertilizing efficiency of the phosphoric acid, insoluble in 2 per cent citric acid, of various samples of phosphatic slag. The results obtained confirm those of similar experiments in 1905 and 1906 (E. S. R., 17, p. 953; 18, p. 1113) in showing a decidedly lower fertilizing efficiency for the phosphoric acid insoluble in 2 per cent citric acid in case of the three crops. The authors conclude, therefore, that the content of phosphoric acid soluble in Wagner's reagent is a better basis for purchase of slags than the content of total phosphoric acid.

Comparative tests of Thomas slag and agricultural phosphate, Kuhnert (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 50, p. 422*).—A continuation of previous experiments (E. S. R., 17, p. 649) is briefly reported, in which it was found as in previous years that Thomas slag gave higher yields than the agricultural phosphate.

On the fertilizing value of salts of manganese, L. Grandeau (*Jour. Agr. Prat., n. ser., 14 (1907), No. 52, pp. 808–810; abs. in Rev. Gén. Agron., n. ser., 3 (1908), No. 2, pp. 49, 50*).—Attention is called especially in this article to experiments by von Feilitzen on moor soils at Flahult, near Jönköping, Sweden (E. S. R., 19, p. 1022). The author concludes from his review of this work, as well as that of other investigators, that while interesting results have been obtained with manganese salts, particularly the sulphate, these results are not of sufficient importance to warrant the regular use of such materials as fertilizers.

The American fertilizer handbook (*Philadelphia, 1908, pp. 244, figs. 2*).—This contains articles on National Fertilizer Association, census of the fertilizer industry, the phosphate movement, 1906–7, points for fertilizer salesmen, sulphuric acid catalytic processes, German potassium deposits, American sulphur mines, a study of soils, the "filler" in fertilizers, station analyses of fertilizers, explanations of market quotations, fertilizer materials, Peruvian and other guanos, fish and fish scrap fertilizers, the value of fertilizer, our large rural population, sulphuric acid tables, practical superphosphate manufacture, soluble and insoluble phosphates, the phosphate industry, commercial nitrogen, Chilean nitrate, abattoir by-products, ammonium sulphate, cotton-seed meal, and other sources of nitrogen, as well as fertilizer manufacturers, allied fertilizer trades, and cotton-seed oil meal directories.

Fertilizer materials market (*Oil, Paint, and Drug Reporter, 73 (1908), No. 7, pt. 2, pp. 54–56*).—This is a review of trade in fertilizers during 1907 in the New York, Chicago, Philadelphia, and Charleston markets.

Nitrate of soda in 1907, Maizières (*Engrais, 23 (1908), No. 2, pp. 36–38*).—Statistics of production and consumption of nitrate of soda for many years past are given. The total production in 1907 is stated to have been 1,665,000 metric tons. Of this amount Europe consumed 1,274,000 tons, America 345,000 tons. A comparison with statistics for previous years shows that the European consumption increased 33,000 tons in 1907, while that of America decreased about 10,000 tons.

Nitrate of soda (*Chem. Trade Jour., 42 (1908), No. 1078, pp. 48–51*).—This article gives statistics and discussion of the nitrate of soda industry in 1907. It is reported that the world's consumption of nitrate in 1907 was 1,646,890 tons or only 7,590 tons greater than that of 1906. The organizations and combinations controlling the trade and the outlook for 1908 are also discussed.

Agricultural uses of crude ammonia, E. Bouant (*Sci. XX. Siècle, 5 (1907), No. 60, pp. 356–359, figs. 5; abs. in Sci. Amer. Sup., 65 (1908), No. 1675, p. 95*).—This article summarizes information regarding the manufacture and use of this material as an insecticide, weed destroyer, and fertilizer. See also a previous note (E. S. R., 18, p. 325).

The material has been prepared for many years in all large French gas works by absorbing the nitrogenous compounds in the Laming mixture of slaked lime, ferrous sulphate, and sawdust. It is reported that 13,000 tons of crude ammonia are annually produced in France and 8,000 tons are imported. It is utilized in the manufacture of ammonium sulphate, Prussian blue, pure sulphur, and a mixture known as precipitated sulphur, which is used by grape growers as a remedy for mildew. The greater part of the material, however, is used directly in agriculture as an insecticide, a destroyer of weeds, and a fertilizer. Its value as a fertilizer has not yet been very definitely determined, but it has been shown to be effective as a weed destroyer and insecticide.

On the influence of plant constituents on the physical and chemical properties of peat, V. Zailer and L. Wilk (*Ztschr. Moorkultur u. Torfverwert., 1907, pp. 1–109; Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 11, pp. 787–

816; abs. in Chem. Zentbl., 1907, II, No. 9, pp. 732–734; 1908, I, No. 3, pp. 283, 284; Jour. Chem. Soc. [London], 94 (1908), No. 543, II, p. 60; Chem. Abs., 2 (1908), No. 6, pp. 878, 879).—The importance of a study of the botanical origin and characteristics of peat deposits as an aid in understanding their chemical and physical properties is emphasized. The characteristic vegetation from which certain Austrian upland and lowland moors have been derived is described and the determining influence of the vegetation on the color, structure, coherence, absorptive power, composition of the organic and inorganic matter, and fuel value of the peat is pointed out.

The Austrian moors are classified as follows with reference to the principal forms of peat which they yield which are of value for cultivation, for litter, and for fuel: Sphagnum, wool-grass moss, Carex, reed, Hypnum, Scheuchzeria, Eriophorum, wood, raw moor humus, and liver peat.

The hygroscopicity of undecomposed peat is higher than that of decomposed, although the latter contains more humus substances which are highly hygroscopic. The absorptive power of peat for ammonia depends less upon the botanical composition than upon the free humic acids and colloids present. The ash content of peat is as a rule higher than its botanical composition would indicate. This is accounted for by admixture of foreign mineral matter. Of the ash constituents of the plants forming peat the easily soluble potash and sodium salts have been almost completely leached out. The phosphoric acid has been removed to a moderate extent and lime and iron have remained almost entirely undissolved. As a result peat is often very rich in these constituents. Scheuchzeria peat is especially rich in phosphoric acid, which appears to be combined with iron.

The nitrogen content of peat depends primarily upon the nitrogen content of the plants from which it has been formed and secondarily upon chemical processes resulting in absorption of ammonia and upon the accumulation of chitin remains of insects, etc. Only very resistant forms of nitrogen accumulate in peat.

Sphagnum moss and undecomposed sphagnum peat has a very strong acid reaction due to free organic acids. This explains in part the high absorptive power of these substances for ammonia.

The heating value of the different peats was found to vary widely (more than 25 per cent) and no close relation was observed between the fuel value and the ash content of the water-free substance.

The nitrification of peat in artificial niter beds, F. Desprez (*Betterave, 18 (1908), No. 443, pp. 10–13*).—A method of constructing a peat niter bed devised and successfully operated for several years by E. Bazin, a sugar manufacturer of Laon, is described. The bed is constructed and operated upon essentially the same principles as those recently described by Müntz and Lainé (E. S. R., 18, pp. 323, 430). It is stated that when nitrification in these beds is in active operation they produce from 350 to 400 gm. per cubic meter of peat every 24 hours.

Report on trials of machinery used in the peat industry, 1906 (*Meddel. K. Landtbr. Styr. [Sweden], 1907, No. 8 (127), pp. 79, figs. 36*).—The methods and apparatus used are described and results of trials of various kinds of machinery at the testing station of the Royal Agricultural Department at Utförd, Sweden, are reported.

The utilization of atmospheric nitrogen in its economic and social relations, P. B. Giovanni (*Riv. Internaz. Sci. Soc., 44 (1907), No. 172, pp. 481–493*).—The importance of devising commercial means of utilizing the nitrogen of the air independently of leguminous plants as security against a shortage of the

nitrogen supply and a consequent bread famine is briefly discussed in this article.

The high-tension arc and the fixation of nitrogen, G. Brion (*Phys. Ztschr., 8 (1907), No. 21, pp. 792–799, figs. 12; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 121, p. 69*).—The author discusses the characteristics of the high-tension arc and the electrochemical relations. He also describes the arrangement which he employed and the results obtained in his studies on this subject. He obtained the same yield per kilowatt for direct and for alternating currents, thus practically confirming Birkeland's figures.

Experimental investigations on the high-tension arc, G. Brion (*Ztschr. Elektrochem., 13 (1907), No. 48, pp. 761–786, figs. 26; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 121, p. 69*).—This is a full account of experiments partly reported in the article noted above.

The manufacture of calcium cyanamid, J. B. C. Kershaw (*Chem. Trade Jour., 42 (1908), No. 1078, pp. 61–64, figs. 4*).—The Frank and Caro process and its modifications are described as well as the progress made in Europe in the commercial application of the process. The probable cost of nitrogen in the product by this process is discussed and suggestions are made regarding the use of the lime nitrogen as a fertilizer. A list is also given of the principal English patents covering the process. It is stated that a factory located at Odde in Norway will during 1908 manufacture a product which will be put on sale in England at about $2.40 per ton cheaper than ammonium sulphate of the same nitrogen content. The present English market price of sulphate of ammonia is about $58.40 per ton.

The action of sulphuric acid on calcium cyanamid, T. Jona (*Gaz. Chim. Ital., 37 (1907), II, No. 6, pp. 558–562; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 5, p. 224*).—The author concludes from the investigations briefly reported in this article that under the conditions obtaining in his experiments the action of sulphuric acid on calcium cyanamid results in the formation of dicyanodiamidin sulphate corresponding to the formula $(C_2H_6ON_4)_2$. H_2SO_4. $2H_2O$. Further investigations to determine whether this material can be economically produced on a commercial scale are in progress.

Other uses for lime, A. Pardy (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 11, pp. 1369–1372*).—This article briefly discusses the use of lime in the preparation of citrate of lime, calcium cyanamid, and calcium nitrate with a view to the possible introduction of the manufacture of these products into Natal.

The German potash industry, K. Kubierschky (*Die Deutsche Kaliindustrie. Halle, 1907, pp. VIII+122, figs. 8; rev. in Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 7, p. 648*).—This is the third volume of Wohlgemuth's monographs on chemical-technical methods of manufacture. The mineral salts occurring in the potash deposits are described as well as the processes, products, and by-products of manufacture of these salts.

The manufacture of potash in North Caucasus (*Vyestnik Finansov, 24 (1907), No. 44, pp. 134, 135; abs. in Chem. Ztg., 32 (1908), No. 1, Repert., p. 3; Rev. Sci. [Paris], 5. ser., 9 (1908), No. 4, p. 117*).—The preparation of potash as a by-product of sunflower culture in this region is described. The potash is prepared by lixiviation of ashes of the stalks, steams, leaves, etc., of the sunflower, evaporation of the solution, and calcination of the residue, the methods employed being very primitive.

It is stated that 24 factories in Caucasia produced about 12,600 to 16,200 tons of potash in 1907, valued at $1,133,000. About one-fourth of the product is used in Russia, and the rest is shipped to foreign countries, some being exported to this country. A very pure product is prepared containing 90 per cent

of potassium carbonate and no soda. The medium and better classes of soils produce from 2,600 to 4,000 lbs. of stalks, stems, etc., per acre, containing an average of 3 to 4 per cent of ashes. One acre of sunflowers, therefore, produces about 160 lbs. of ashes and 40 to 53 lbs. of potash. The crude ashes bring from 0.5 to 0.8 cts. per pound.

Phosphate beds [of South Carolina], E. Sloan (*Handbook of South Carolina. Columbia: State Dept. Agr., Com. and Immig., 1907, pp. 125–127*).—Deposits of this material in the State are briefly described.

The phosphate minerals from Elder Rock, D. Mawson and W. T. Cooke (*Trans. Roy. Soc. So. Aust., 31 (1907), pp. 65–70, fig. 1*).—The investigations on this subject are summarized as follows:

"(1) Elder Rock is a prominent, abrupt mass, standing in a level plain in the arid northern districts of South Australia.

"(2) A hard yellow phosphate encrusting the top of the rock is the remnant and more insoluble part of a larger deposit of guano, chiefly bird-derived.

"(3) The soluble salts of the guano have, to some extent, saturated the rock for a depth below; in a favorable spot this impregnation has been effective for at least 46 feet in the vertical. These compounds are chiefly nitrates of ammonia, with some fixed alkali and phosphate. The more soluble compounds have percolated to greater depths.

"(4) The hard yellow phosphate on top of the rock is a mixture of the minerals, chiefly iron and aluminum phosphates, and has no definite composition; it is, however, here referred to as paratooite. Two widely divergent types are described, the commoner near to evansite, and a scarcer globular phosphate related to beraunite.

"(5) Paratooite probably has a wide distribution, as small scattered occurrences in the arid northern parts of South Australia.

"So far as we are aware, no similar phosphate has ever previously been described from Australia."

Phosphatic slags, P. Marsais (*Rev. Vit., 29 (1908), No. 733, pp. 9–12*).—Information regarding the manufacture, composition, and use as a fertilizer of different kinds of phosphatic slags is summarized in this article. Attention is called to the beneficial results obtained from large applications of slag in the Rhine vineyards and it is pointed out that the increasing demand and rising price of the material raises the question of replacing slag by mixtures of superphosphate and mineral phosphates.

Phosphatic fertilizers, G. Fasoli (*Indus. Chim., 7 (1907), pp. 327, 328; abs. in Chem. Zentbl., 1908, I, No. 4, p. 421*).—The preparation of superphosphates is briefly described and the following are given as the best conditions for this purpose: Sulphuric acid of between 50 and 53° Baumé and a temperature not to exceed 110° C. The fertilizer should never be mixed with gypsum, since the latter reduces the solubility of the superphosphate on standing.

On the reversion of phosphoric acid in superphosphates, K. Herbst (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 36 (1907), pp. 645–652; abs. in Chem. Zentbl., 1908, I, No. 3, p. 285*).—The author gives a brief summary of previous investigation on the reversion of phospheric acid. He attributes such reversion in superphosphates to the action of iron salts, particularly ferrous and ferric sulphates, which are formed in the process of treating natural phosphates with sulphuric acid in the manufacture of superphosphate. The calcium and magnesium salts present in superphosphates are practically without effect in this respect. It is explained that by the action of ferrous and ferric salts on monocalcium and monoaluminum phosphates insoluble ferric phosphate ($FePO_4+xH_2O$) is formed. In the presence of free sulphuric acid a double ferric-aluminic phosphate ($Al_2O_3.Fe_2O_3(P_2O_5)_2+H_2O$) is formed. The author

emphasizes the importance in the manufacture of superphosphates of avoiding as far as possible the formation of ferrous and ferric salts or of rendering them harmless.

The world's production of phosphates in 1907, MAIZIÈRES (*Engrais, 23 (1908), No. 7, pp. 156–158*).—The world's production during 1907 is placed at 4,347,107 metric tons as against 4,092,243 tons in 1906. Of this amount the United States furnished 1,917,000 tons in 1907 as against 2,052,000 in 1906.

[South Carolina] marl, E. SLOAN (*Handbook of South Carolina. Columbia: State Dept. Agr., Com. and Immig., 1907, pp. 121, 122*).—A brief account is given of deposits of this material in the State.

Commercial fertilizers, W. J. JONES, Jr., O. C. HAWORTH, and E. G. PROULX (*Indiana Sta. Bul. 125, pp. 63–139, map 1*).—This bulletin gives results of analyses of 793 samples of fertilizers inspected during 1907 with full text of the Indiana fertilizer law and notes on its enforcement, estimated sales of different classes of fertilizers in the State, and a review of results of inspection for the six years 1902 to 1907. It is estimated that 100,791 tons of fertilizer, valued at $2,341,842, was sold in Indiana in 1907.

Commercial fertilizers, J. L. HILLS, and C. H. JONES (*Vermont Sta. Bul. 134, pp. 35–51*).—This is the first report on fertilizer inspection for the season of 1908 and contains analyses of 60 brands of fertilizers.

AGRICULTURAL BOTANY.

The occurrence of rennet in the Papaveraceæ, C. GERBER (*Bul. Soc. Bot. France, 54 (1907), pp. VII–XVI*).—The author describes the occurrence of rennet or a similar substance that coagulates milk in a number of species of plants belonging to the poppy family, and gives the results of experiments with the juices of a number of these plants in the coagulation of milk.

The properties of rennet are found quite marked in *Chelidonium majus* and *Mecconopsis cambrica*, while they are less pronounced in *Papaver rhœas*, *Rœmeria hybrida*, *Hypecoum pendulum*, *Glaucium luteum*, and *G. corniculatum*. In studying these rennet-like substances, the author finds that they fall into two classes, which may be distinguished as the type occurring in the genus Papaver and the type represented in Glaucium.

The presence of a nitrate-reducing enzym in green plants, ANNIE A. IRVING and RITA HANKINSON (*Bio-Chem. Jour., 3 (1908), No. 1–2, pp. 87–96*).—The question as to the form in which nitrogen is most easily assimilated by the green plant has long been under discussion, and various conflicting views have been given regarding it. There appear but few statements in the literature of plant physiology suggesting the presence of a nitrate-reducing enzym, but the authors' investigations seem to show that a general distribution of such an enzym is to be expected if nitrates are utilized in the formation of proteids. The present paper is the outcome of work carried on upon this hypothesis.

Experiments were conducted with a number of water plants, as these offered greater facilities for collecting and examining gases than others. The results obtained were checked up by application to other plants.

The theory of the presence of an enzym capable of reducing nitrates in green plants seems to be established, and the authors report the extraction of such an enzym from grass. Later the same enzym was found present in a number of other plants, including various grasses, iris, *Vicia faba*, etc. In the case of the species of Vicia the enzym was found in all parts of the plant, but the reaction was stronger in starting and slower in progress in the case of the roots when placed in the nitrate and asparagin solution.

So far as their experiments go, the authors claim that there is no reason to doubt the general distribution of such an enzym in green plants. In the normal plant the only conditions necessary for nitrate reduction seem to be the presence of the enzym found in roots, stems, and leaves, and a suitable carbohydrate. The latter condition suggests the green leaf as the center of reduction, and this agrees with the distribution of nitrates in the plant.

The rôle played by proteins and the decomposition products of albuminoids in fermentation, EHRLICH (*Amer. Brewer, 41 (1908), Nos. 1, pp. 10, 11; 2, pp. 61–64*).—This is a paper, read by the author before a brewing association at a meeting in Berlin, in which he describes the rôle played by albuminoids in the process of fermentation. He calls attention to a newly discovered property of proteids in their behavior during fermentation and to a new reaction of yeast cells. This subject is at present believed to be of theoretical interest only, but will undoubtedly prove of considerable application.

"Up to the present time it has been generally accepted that only carbohydrates, maltose, etc., are capable of undergoing alcoholic fermentation through the agency of the yeast. It has now been found, however, that in every fermentation of sugar by living yeast cells the albuminoids in their last stage of decomposition—i. e., in the form of amino acids—suffer decomposition, inasmuch as they are decomposed not only into carbonic acid and others, but also mainly into alcohol, besides some aldehyde and acids of various form, so that we may now justly speak of an alcoholic fermentation of albumen. This hitherto unknown protein fermentation is not limited to the nitrogenous substances of the wort, but extends to the yeast albumen also; it is brought about by a peculiar breaking down and building up of the albumen of the living cell and leads to the formation of a number of nonnitrogenous substances. Up to the present these substances had erroneously been regarded as by-products of the fermentation of sugar."

A study of the rôle and function of mineral salts in the life of the plant, N. T. DELEANO (*Inst. Bot. Univ. Genève [Pub.], 7. ser., 1907, No. 9, pp. 48; abs. in Bot. Centbl., 107 (1908), No. 1, p. 4*).—According to the author, there is a double movement of mineral material during the life of the plant, one from the soil to the plant and the other from the plant to the soil. These movements are termed by him positive and negative migrations. Concerning the latter there appears to be but little information, and it is with this that the author has carried on investigations.

He found under certain conditions that plants could return to the soil mineral matter equal to 50 per cent of the plant's weight. While the nitrogen content of the plant remains fairly constant after once attaining a maximum, and the carbohydrates increase and are stored up, the mineral matter gradually diminishes until the death of the plant. The cause of this negative migration is said to be due to the fact that the mineral matter is not truly assimilated by the plant but is held by the plasma of the cells through its semipermeability. When the vitality of the cell becomes reduced or the cells are dead the plasma becomes permeable and the mineral matter escapes by simple diffusion.

The experiments upon which the author's conclusions were based were conducted with oats fertilized in various ways. He found with these plants that the water content began to diminish after the forty-third day and at the same time the mineral matter began to decrease. In this way the composition of the plant juices remained practically constant.

The possible rôle of light in relation to alpine plants, C. H. SHAW (*Abs. in Science, n. ser., 27 (1908), No. 687, p. 339*).—The author reports that readings of the actinometer and the black bulb thermometer in vacuo in the region about the Selkirk Mountains seem to prove that light at high altitudes is considerably

more intense than on adjacent lowlands, and that the difference is chiefly in the refrangible end of the spectrum.

Cultures of plants were made by the writer, and when additional blue-violet light was allowed to fall on the plants growing in ordinary daylight the plants exhibited a distinct response. The leaves were more hairy and the internodes shorter than in the control series.

It is believed probable that the character of the light at high altitudes may have a morphogenetic value differing materially from that at low altitudes.

The carbon assimilation of Penicillium, H. Hasselbring (*Bot. Gaz., 45 (1908), No. 3, pp. 176–193*).—In order to gain some knowledge of the complex problems of the assimilation of some of the simpler carbon compounds, the author undertook a series of experiments to study the effect of a number of related compounds on the growth of mold fungi. *P. glaucum* was selected on account of its omnivorous habits. To the inorganic medium in which it was cultivated, alcohol, potassium ethyl sulphate, ethyl nitrate, ethyl acetate, potassium acetate, and acetic acid were added. The cultures were all made in Erlenmeyer flasks of 200 cc. capacity, and the growth in the different media determined.

It was found that alcohol, acetic acid, and the substances from which the acetic acid radicle is readily derived are assimilated by *P. glaucum*. In the case of alcohol the addition of mineral acids stimulates growth, but nitric acid produces greater stimulation than hydrochloric. The esters of alcohol with mineral acids were found valueless as sources of carbon, and their lack of nutritive value was not due to any toxic properties. In general the substances which possess the greater food value are those which are most readily oxidized.

A number of interesting observations incidental to the experiments are reported. Among them, it is shown that, contrary to the current belief that substances which permit vigorous growth of mycelia are not suitable for the germination of spores, alcohol was not only very favorable for growth, but permitted an abundant germination of spores. It was further noted that in none of the cultures containing alcohol was there any production of spores by the fungus.

Another fact brought out was the great individual difference of resistance of spores to deleterious agents. "In the lower concentration of all substances favorable for growth, practically all spores germinated, forming a dense matlike growth over the surface of the culture fluid. When, with increase of concentration, the substance becomes deleterious, germination and growth are not stopped abruptly, but the number of colonies becomes fewer and fewer until the final concentration is reached, where germination of even the most resistant spores is inhibited. In most cases, where only a few colonies were formed, these grew with unusual vigor, so that the total weight of the culture was often as great as that of cultures of lower concentrations."

Assimilation of zinc by Sterigmatocystis nigra, M. Javillier (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 7, pp. 365–367*).—The stimulating effect of dilute solutions of zinc when added to culture media in which *S. nigra* is grown has been reported. The author has carried on experiments to determine the amount of zinc assimilated by this fungus, and he has found that where the quantity of the metal does not exceed 1 part to 250,000 of the culture media, all the zinc is taken up by the fungus. Where a greater amount is added there is a proportional diminution in the relative amount of zinc fixed by the fungus. It seems that *S. nigra* is able to assimilate without injury a quantity of zinc equal to 1/1100 of its weight.

Injury to vegetation and animal life by smelter wastes, J. K. Haywood (*U. S. Dept. Agr., Bur. Chem. Bul. 113, pp. 40, pls. 8*).—The results are given of

investigations in regard to the injury to vegetation and animal life observed by the author in the vicinity of certain smelters, particularly one located at Anaconda, Mont. From all the work in the vicinity of Anaconda, the author draws the following conclusions:

"(1) The forests around the smelter appear from actual chemical analysis to be injured for at least 10 miles north of the smelter, 6 miles south of the smelter, and 13 miles west of the smelter.

"(2) This injury to forests by sulphur dioxid undoubtedly extends to a distance of 15 to 20 miles north of the smelter, 8 miles south of the smelter, 15 miles west of the smelter, and perhaps even farther in certain localities, although not proved by chemical analysis.

"(3) The junipers are very resistant to smelter fumes and are able to grow close to the smelter; the red firs are susceptible to the fumes and are badly damaged at distances of about 15 miles or perhaps even farther; the lodgepole pines are intermediate between the other two species of trees, but show damage for at least 10 miles.

"(4) Large quantities of arsenic are discharged from the smelter on the surrounding country, this poison being found in forage crops in large enough quantities to poison cattle.

"(5) The waste from the reduction plant discharged into the Deer Lodge River renders it unfit for irrigation purposes.

"(6) The land irrigated by the Deer Lodge River, containing the waste from the reduction plant, is greatly injured by the copper present in the irrigation water.

"(7) The soils irrigated by the Deer Lodge River which were studied by the writer do not contain enough alkali salts to be injurious to ordinary farm crops."

The methods of analysis are described at length.

FIELD CROPS.

Studies on the improvement of sand, marsh, and heavy clay soils, A. R. Whitson, R. R. Marshall, and E. J. Delwiche (*Wisconsin Sta. Rpt. 1907, pp. 263–285, figs. 4*).—Experiments begun in previous years (E. S. R., 18, p. 1034) for the purpose of improving certain typical sand, marsh, and heavy clay soils of the State by different systems of cropping and manuring were continued in 1907 and the details of the experiments are reported in this article.

Fertilizer experiments with potatoes on sandy soils at Sparta resulted in the heaviest yield from the plat receiving 30,000 lbs. of barnyard manure per acre, the yield consisting of 90.83 bu. of large and 16.33 bu. of small potatoes per acre. The plat treated with 50,000 lbs. of peat, 100 lbs. of potassium sulphate, and 200 lbs. of phosphate stood second with a yield of 55.66 bu. of large and 12.33 bu. of small potatoes per acre. The results in general indicate that the most serious need of the land is nitrogen and that very little benefit is to be derived from the use of commercial fertilizers.

Crimson clover made a fair growth on manured land and developed nodules. Alfalfa made a very poor growth, developed no nodules, and showed practically no benefit from fertilizers. Alsike clover made a fair growth on the manured soil and a very poor growth on other portions of the field. Cowpeas developed nodules quite generally and made a good growth.

At Iron River the largest yield of oat hay on sandy soil was 1,824 lbs., obtained on the plat receiving 20,000 lbs. of manure. The plat receiving peat, rock phosphate, and potassium sulphate and the one treated with ground limestone and sodium nitrate ranked next in yield. These results also plainly show the

need of nitrogen in the soil. Where peas and oats were grown for hay the barnyard manure plat produced 1,360 lbs. of hay per acre and the sodium nitrate and ground limestone plat 1,304 lbs. The largest yield in potato trials at this farm was secured on the plat treated with barnyard manure, followed by the plat receiving acid phosphate, potash, and ground limestone. Ground limestone seems to have been beneficial but not to the same extent as the nitrogenous substances supplied. Hairy vetch sown in the summer of 1906 produced an excellent stand, and the following season the yield of hay was estimated at 1⅛ tons per acre.

On marsh soil at Marinette barley gave a slightly better yield on the plat receiving 30,000 lbs. of barnyard manure per acre, but the use of 300 lbs. of acid phosphate and 2,000 lbs. of wood ashes gave nearly as large a yield, and this is regarded as indicating that for barley the chief need of this soil is for the mineral elements phosphoric acid and potash. Barnyard manure was the most effective fertilizer for potatoes. The use of 10,000 lbs. per acre produced an increase of 50 bu., of 20,000 lbs. an increase of nearly 100 bu., and an application of 30,000 lbs. an increase of 130 bu. per acre. At 30 cts. per bushel this indicates a value on such land of $3 per load for good barnyard manure. The experiments with potatoes indicate in general that the crop is well adapted to this soil when well drained, and that manure where available is probably the best fertilizer but that wood ashes applied at the rate of about 1 ton per acre together with 300 lbs. of acid phosphate per acre, or 50 to 75 lbs. of sulphate of potash with 400 lbs. of acid phosphate, can be substituted for the manure.

At Phillips, where barley, timothy, and alsike clover were grown, the results seemed to show that there is some other difficulty than the lack of available mineral elements or acidity in the soil. It is believed possible that the infertility is due to a slow rate of nitrification, although it is not understood why wood ashes should have a much more marked effect than lime when supplemented with both potash and phosphate on this soil.

At Superior the tile-drained land averaged 20.2 bu. of barley, 12,956 lbs. of sugar beets, 171 bu. of potatoes, and 12,820 lbs. of corn per acre, as compared with 11 bu. of barley, 11,367 lbs. of sugar beets, 170 bu. of potatoes, and 7,862 lbs. of corn per acre on untiled land. This was a dry season and the effect of drainage for this reason was less marked. There was little difference in the crop of corn whether barnyard manure was plowed under or given as a top-dressing, while in the case of potatoes there was a greater difference, the top-dressed plat yielding at the rate of 161.5 bu. per acre as compared with 180.1 bu. on the plat on which the manure was plowed under.

At Ashland there was a difference of 11.6 bu. of barley, 11.42 bu. of oats, 1.33 tons of corn, and 3.87 tons of sugar beets per acre in favor of tiled as compared with untiled land. Fertilizer experiments with these same crops indicate the lack of nitrogen in available form, and it is believed that the growing of clover or some other leguminous crop is necessary to make the soil fertile.

The relation of orchard cover crops to soil moisture and soil freezing, E. J. Delwiche and J. G. Moore (*Wisconsin Sta. Rpt. 1907, pp. 379–385*).—Observations and determinations on a number of different cover crops are reported. The relative rank of the different crops as to ease in getting a catch, obtaining an early cover, resistance to drought, frost, shade, and attacks of fungi, immunity from insect attacks, ability to withstand tramping, efficiency in lowering the moisture content in late summer and early fall, soil moisture-holding capacity, and snow-holding efficiency is recorded.

Oats, rape, rye, and millet were most readily started, cowpeas were the first to form a cover and also ranked first in drought resistance, field peas stood

shade best, soy beans showed the greatest resistance to fungus diseases and cowpeas to insect enemies, hairy vetch stood tramping best, rye was the hardiest crop, turnips were most effective in lowering the moisture content of the soil in late summer and early fall, crimson clover showed the greatest efficiency in holding soil moisture, and Canada peas in holding snow. No choice is made as to protection against deep freezing of the ground. It is stated that a cover crop decreases the depth of freezing by at least one-half. Moisture determinations made in the spring showed that the average moisture content of the covered ground was considerably more than that of the bare ground.

The improvement of mountain meadows, J. S. Cotton (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 127, pp. 29, pls. 4*).—The results reported in this bulletin show that mountain meadows may be greatly improved by reseeding with tame grasses, and that for this purpose timothy and redtop are best. It is stated that the introduction of timothy into a devasted mountain meadow will increase its acre-carrying capacity for a 1,200-pound steer at least 1 month and ordinarily 2 months. The cost of introducing timothy is given at 95 cts. per acre, and the value of the pasturage is estimated at 25 cts. a month for each head of stock. Redtop is valued mainly in reseeding places too wet for timothy. A mixture of the two is considered valuable because timothy gives returns quickly, while redtop is more permanent. These grasses should be sown in the late autumn in order to save the expense of harrowing.

The cost of introducing brome grass, tall fescue, and orchard grass, which have proved well adapted to mountain meadows, is too great for their extensive use. Mountain brome grass readily re-covers the gravelly hillside areas denuded by over-grazing, but other grasses are preferred by the stock. In introducing large-seeded grasses, like brome grass, mountain brome grass, etc., harrowing is almost necessary. Plowing is ordinarily impracticable and sometimes positively injurious. Drainage, partial irrigation, and the filling in of old washouts are sometimes aids to meadow improvement.

Building up a run-down cotton plantation, D. A. Brodie (*U. S. Dept. Agr., Farmers' Bul. 326, pp. 22, figs. 9*).—An account is given of the progress made in 3 years in changing a run-down cotton plantation in Arkansas into a profitable stock and hay farm. In 1905 this farm produced one-fourth of a bale of cotton and 15 bu. of corn per acre; in 1906, after a crop of cowpeas, it produced one-half of a bale of cotton and 37½ bu. of corn per acre, and in 1907, after a crop of cowpeas, it produced one-half of a bale of cotton and 34 bu. of corn per acre. After cowpeas and 300 lbs. of commercial fertilizer it produced nearly three-fourths of a bale of cotton per acre, and after cowpeas and clover continuously for 2 years 1 bale of cotton to the acre.

Deep plowing had no detrimental effect upon the yields, and planting cotton and corn in check rows and cultivating both ways saved seed and labor and did away with chopping and hoeing. Red clover proved successful in this latitude as a soil builder and as a hay and seed crop, but cowpeas were the most important factor in building up the fertility of the soil. Planting the cowpeas in rows 3 ft. 6 in. apart is recommended as saving seed and bringing greater returns in yields of seed and hay.

Crimson clover, bur clover, and the vetches were successful as winter cover crops after inoculation had been thoroughly established, but early planting in the autumn was absolutely necessary for the best results with these winter crops. It is stated that on worn-out soils from 2 to 3 years are required to inoculate the land with the proper bacteria for the different leguminous crops.

Small farms in the corn belt, J. A. Warren (*U. S. Dept. Agr., Farmers' Bul. 325, pp. 29, figs. 3*).—Descriptions are given of two 40-acre farms and one 20-acre farm in Nebraska, with an account of the methods of crop rotation and

cultivation as practiced, and itemized statements of the cost of equipment and production of the crops, with the financial returns for several years.

Annual report of the Porto Rico Experiment Station for 1907 [Field crops], D. W. May (*Porto Rico Sta. Rpt. 1907, pp. 8–12, 16, 17*).—A brief outline of the work with sugar cane, tobacco, fiber crops, and forage crops is given.

The station has a number of seedling canes containing from 15 to 19 per cent of sucrose in the juice, while the average content in the cane now grown on the island is about 10 per cent. These seedling canes are being distributed over the island. Fertilizer experiments at the station seem to indicate the lack of nitrogen in the soil, and in tests to determine how best to supply this element by the growing of leguminous crops the cowpea and the soy bean have given the most promising results. The cowpea will mature in 70 days and can, therefore, be grown between the rows after planting the cane and again after the last plowing. Trials are also in progress as to distance of planting in cane production. In this work the cane is planted in lots 5 by 5 ft. up to 10 by 10 ft., and also in continuous rows. In the first crop the narrow planting gave the heaviest yield. The figures for the rattoon crops could not be given as these crops had not been harvested. Planting the canes in lines and covering entirely with earth has, where the changa is not too bad, proved a better practice than sticking canes in the ground on end as is the usual custom. Numerous suggestions in the line of improved cultural methods are given.

Of the different fiber crops tested sisal seems to be the most promising. Abacá grows well on the island but requires fertile soil, which fact prevents its extension, as land suitable for it can be more profitably employed in growing other plants. The carludovica plant, which furnishes the fiber for genuine Panama hats, has been introduced with a view to distribution. Sea Island cotton is grown to some extent, but as a rule planters are hard to interest in cotton growing. The cotton caterpillar is a great menace to the crop.

Guinea and malojillo grass are the main sources of forage. As forage crops rich in protein, cowpeas and velvet beans have succeeded best at the station. Alfalfa may be grown but is readily choked out by the vigorous native grasses.

In notes on the fermentation of tobacco by O. Loew, it is pointed out that the curing as well as the fermentation of this product is not so carefully conducted in Porto Rico as in the United States. It was observed in Mayaguez that the temperature of re-piled bulks reached only 44.5° C., while such bulks in Florida have reached 55 to 56° C. To prevent excessive after-fermentation in bulk the bales of tobacco in some establishments are now made up in leaves of the royal palm instead of the porous burlap which admits too much air. It is also mentioned that wrapper leaves grown under cheese-cloth when held under light often show green spots after fermentation.

Experiments with grain and forage plants, 1907, R. A. Moore, A. L. Stone, and E. J. Delwiche (*Wisconsin Sta. Rpt. 1907, pp. 386–408, figs. 5*).—At the station 24 varieties of oats, 27 of barley, 4 of winter wheat, 6 of rye, and 1 of buckwheat were tested.

In the test with oats Joannette, a black variety, ranked first with 35 bu. per acre, Kherson second with 33.7 bu., and Sixty Day third with 28 bu. Joannette also ranked first in weight per measured bushel with 30 lbs.

Oderbruck barley ranked first in the barley experiments with a production of 48 bu. per acre. This variety and Manshury have been selected and distributed by the station and constitute at least one-half of the barley crop of the State. Barley breeding work is carried on and of 16 different strains of pedigreed barleys grown at the station this year sufficient seed of each was secured to plant 2 acres in 1908. Of 4 varieties of winter wheat Iowa led in yield with 28.3 bu. per acre, followed by Minnesota No. 695 with 26.6 bu.,

and Minnesota No. 550 and Beloglina with 25 bu. Minnesota No. 2 rye yielded 42.5 bu. per acre, Minnesota No. 1, 41.4 bu., Ivanoff 40.3 bu., Petkus 35.7 bu., and Schlansted 32.8 bu., while Olds Mammoth Spring produced only 20.7 bu. per acre. Two new varieties bred from Schlansted and Petkus foundation will go into the increase plats in 1908.

The varieties of corn under test were Silver King, Golden Glow, Smut Nose flint, and Early Yellow Dent. These varieties were tested by the ear-to-the-row method. Thirty-seven ears of Silver King ranged in seed ear production from 19 lbs. to 61 lbs., and in total yield from 83 lbs. to 276 lbs. A row of the 1906 crop was left standing through the winter to determine its vitality. In the fall the row was thoroughly matured before freezing weather and all ears showed a uniform germination of 100 per cent prior to zero weather. After the thermometer had registered below zero the viability of the corn immediately dropped in all ears with the exception of one, which gave a test of 100 per cent throughout the winter. The progeny of this ear, however, did not show the vigor of the kiln-dried corn nor did it produce any greater number of good seed ears. The general corn field of 18 acres planted with tested seed, the progeny of high-yielding rows from the seed plat of 1906, gave an average yield of 63.8 bu. of seed corn per acre. The approximate cost of production per bushel is estimated at 29.5 cts.

Oderbruck barley tested near the Iron River farm yielded 36 bu. per acre. At Ashland and Superior this barley yielded 20 bu. per acre in an unfavorable season. In trials of brewing barleys, many of which were not acclimated, only low yields were secured, partly because of the dry season.

Swedish Select oats gave 20 bu. per acre at Superior, 12½ bu. at Iron River, and an average of 18 bu. at Ashland. The weight per bushel averaged 38 lbs. at Ashland and Superior and 33 lbs. at Iron River. Sixty Day and Tobolsk stood first in rust resistance but last in yield.

The winter wheat varieties grown at Ashland and Iron River suffered from winter-killing and gave low yields. The best showing was made by Beloglina, Kharkoff, and Padii.

Silver King corn at the Iron River farm gave a yield of 12¾ tons of silage corn and 84 bu. of ear corn per acre, and Early Yellow Dent 10 tons of silage and 55 bu. of ear corn. The corn had matured when frost came on September 25. Several varieties of flint corn tried at Superior and at Ashland did not reach full maturity.

A good stand of alfalfa was secured on the Iron River farm by sowing the seed in the fall of 1906. In 1907 the field was clipped three times and by September 20 the alfalfa was a foot high, apparently well established, and almost of a perfect stand. The field had been inoculated with soil and nodules were abundant on the roots of the plants. Soy beans were ripe September 20 and gave a yield of 12 bu. per acre. Soil inoculation in this case also seemed to have favored the development of the nodules. Thirty-seven strains of medium red clover were sown in the spring of 1907 on the Iron River farm, and on the whole a fair catch was secured, although dry cold weather affected the stand. At Superior alsike clover yielded 5 bu. per acre, and near Ashland 8 bu. of clean seed was secured on a 1-acre tract.

Cooperative alfalfa work for 1908, C. G. Williams and L. H. Goddard (*Ohio Sta. Circ. 80, pp. 4*).—The plan for cooperative alfalfa work for 1908 is briefly described, and cultural notes are given, together with an application blank, for those wishing to cooperate with the station.

Barley culture in the northern Great Plains, M. A. Carleton (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 5, pp. 12*).—The development of barley culture in the United States, and in this particular section, is discussed and tables are

given showing the comparative yields of a number of different varieties of barley at several experiment stations. Notes on two-rowed and six-rowed barley, variety improvement, the maintenance of pure seed, the cultivation and the uses of barley are also given.

Brewing barleys. C. P. Norgord (*Wisconsin Sta. Rpt. 1907, pp. 413–415*).—Among 8 varieties of pedigreed barleys introduced from Svalöf, Sweden, the best yields at the station were secured from Gotland, which yielded 28.7 bu., followed by Svanhals with a yield of 17.1 bu. per acre. Manchuria, a pedigreed variety from Guelph, yielded 26.5 bu. per acre in this experiment. Among a list of common varieties Oderbruck stood first with 32.7 bu., Golden Queen second with 32 bu., Silver King third with 29.5 bu., and Canadian Lake Shore fourth with 29.2 bu. per acre.

The prickly pear as a farm crop. D. Griffiths (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 124, pp. 37, pls. 2*).—The experiments discussed in this bulletin were conducted in a region having a very unevenly distributed annual rainfall, varying from 15.9 to 40.5 in., the average for the past 18 years being 28.4 in. The absolute minimum temperature recorded for the locality is 4° F., this having occurred but once in 18 years. Of the 10 years ended in 1903 in only one was there 7 days with a minimum below 22° F.

It is stated that the plants are best grown from single-joint cuttings planted 2 ft. apart in 6-foot rows. On moist and well prepared ground the cuttings may be distributed on the surface, otherwise they should be placed in a furrow and partially covered. The planting may be done at any time except during the hottest and driest part of summer. Frequent shallow cultivation is given to prevent weed growth and excessive baking of the soil. Plants set in February can be harvested at any time of the year after 20 to 24 months.

Singeing the standing plants has been found most advantageous. It is recommended that a stump of 2 to 4 joints be left in harvesting the plants, and that those most vigorous and most free from disease be selected for planting stock. In the vicinity of San Antonio, Texas, the *Opuntia lindheimeri* best meets these conditions.

An experimental plantation which was made cost nearly $9 an acre, but it is believed that this cost may be reduced to $6 or $7. About 20 varieties of spineless forms are grown at present, but these are considered as practically useless under present Texas conditions except for breeding purposes. It is estimated that the prickly pear under cultivation will produce 22.8 tons of roughage per acre. Eight times as much growth of prickly pear has been secured under cultivation as was obtained without cultivation on ungrazed pastures, and more than six times as much roughage during the past 2 years from prickly pear as from sorghum.

The injuries by the black-spot fungus (*Perisporium wrightii*) and the red spider (*Tetranychus opuntiæ*), to which the prickly pear is subject, are described, but it is believed that both may be controlled by selection of stock and by methods of harvesting. The diseased condition known as dropping of joints is considered as purely climatic.

The soy bean. C. G. Williams (*Ohio Sta. Circ. 78, pp. 8*).—This circular, giving general directions on the culture of this crop, discusses its use for hay, silage, seed, soiling, pasture, and soil improvement, describes the more important varieties, and presents brief cultural notes on soils, fertilizers, seeding, cultivation, harvesting, and thrashing.

The effect of soil inoculation on the distribution of the fertilizer ingredients in soy beans. F. W. Woll and G. A. Olson (*Wisconsin Sta. Rpt. 1907, pp. 164–166*).—Wisconsin black soy beans were grown on inoculated and uninoculated soil. Chemical analyses of the crops indicate that inoculation of the

soil was beneficial by increasing the nitrogen content of the plant, decreasing the percentage of ash constitutents, increasing the percentage of fertilizer ingredients in the roots, increasing the protein content of the beans, and decreasing their oil content. The yield in price per acre of fertilizer ingredients on treated and untreated soils, as calculated on the basis of 15 cts. per pound for nitrogen and 4 cts. per pound for phosphoric acid and potash, shows the value of the phosphoric acid and potash in the beans from the treated and untreated soil to be about the same, but the value of the increase in nitrogen amounted to $2.3½ per acre. These results indicate that soil inoculation not only increases the yield of leguminous crops, but also improves the feeding value since the increased percentage of nitrogen is nearly all in the form of true proteids.

[Fertilizer experiments with sugar beets during the season of 1906], F. W. Woll and C. W. Stoddart (*Wisconsin Sta. Rpt. 1907, pp. 321–336, figs. 3*).—A condensation of Bulletin 150 of the station previously noted (E. S. R., 19, p. 141).

[Fertilizer experiments with sugar beets during the season of 1907], F. W. Woll and R. A. Moore (*Wisconsin Sta. Rpt. 1907, pp. 336–342*).—The fertilizer requirements for sugar beets of the clay loam soil on the agronomy field at the station near Madison, and of the light sandy soil on the substation farm at Iron River, were studied. The Braune Elite sugar beet was grown, and different combinations of the following quantities of fertilizers were applied on tenth-acre plats: Sodium nitrate 20 lbs., potassium sulphate 20 lbs., acid phosphate 40 lbs.

On the agronomy field the beets were planted June 13 and the first samples taken October 18 showed 12.62 per cent of sugar and an average purity of 86 per cent. The beets were harvested November 11, and when analyzed November 15 an increase in the percentage of sugar from the different plats amounted to 4.16 per cent and an increase in the average purity of 3.1 per cent was observed. The average yield obtained during 11 seasons at the station was 17¾ tons of beets and 4,500 lbs. of sugar per acre, but this year the yield on any plat did not much outyield 9 tons of beets and 2,800 lbs. of sugar per acre. As the season was unfavorable no comments or deductions as to the relative influence of various fertilizers seemed warranted. The most pronounced results in the increase of beets and sugar were obtained with phosphoric acid alone or in combination with potash.

At Iron River the average sugar content in the beets was 19.38 per cent and the purity 87.3 per cent. Nitrogen had a more marked influence in improving the yield of beets than any other single fertilizer ingredient, potash ranking next. The quality of the beets was generally improved by the application of phosphoric acid and of nitrogen, while potash had a decidedly depressing influence on the sugar content and the purity. The results in general indicate that in a dry season at least the best fertilizer treatment for sugar beets on the sandy soils of northern Wisconsin consists in the use of nitrogen alone or of nitrogen with potassium or phosphorus.

Sweet potatoes, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 324, pp. 39, figs. 24*).—This bulletin discusses the areas adapted to sweet potato culture, the climatic and soil conditions required, and the latest methods of growing the crop. In addition to giving general cultural directions, the storage, marketing, cost of production, returns, and uses of the plant are considered. The following varieties are described: Big-Stem Jersey, Yellow Jersey, Red Jersey, Southern Queen or Hayman, Pumpkin Yam, Georgia or Split-Leaf Yam, Red Bermuda, Florida, Pierson, Black Spanish, and Shanghai.

Tobacco investigations for 1907, J. G. Moore and A. J. Rogers (*Wisconsin Sta. Rpt. 1907, pp. 365–368*).—Nearly 300 lbs. of seed grown under the direction

of the department of horticulture were distributed in lots from 1 to 6 oz. among approximately 900 growers for the purpose of introducing improved types in place of the older and less valuable varieties now grown.

In the seed breeding work 9 crosses selected from a great many grown during the previous 2 years were used for the selection of plants producing a superior grade of tobacco. Out of approximately 1,000 plants only 5 were deemed worthy of use for further selection.

Fertilizer experiments were conducted on 3 different farms near Janesville. On 2 of the farms no definite results were secured, but on the third where 1,000 lbs. of cotton-seed meal, 750 lbs. of nitrate of soda, 140 lbs. of sulphate of potash, and 1,500 lbs. of bone meal were applied to a 5-acre plat very little rust occurred, while on the check plat a great deal of injury resulted from this disease.

Eradication of farm weeds, R. A. Moore, A. L. Stone, and G. Hutton (*Wisconsin Sta. Rpt. 1907, pp. 411, 412*).—The use of an anti-quackgrass mixture proved to be of no value in eradicating quackgrass. In another test the ground was plowed 6 in. deep in the fall and harrowed to bring the roots of the quackgrass to the surface, which were then raked up and burned. In the spring this same ground was plowed a little deeper than in the previous fall and harrowed again to prevent the growth or the rooting of any of the grass. During a dry period in July the ground was disked and harrowed, and at the last plowing and harrowing in September no more quackgrass roots were found. The grass was entirely eradicated from $\frac{1}{2}$ acre of ground at a cost of $18.

Report of the agronomist, E. M. East (*Connecticut State Sta. Rpt. 1907–8, pt. 7, pp. 397–452, pls. 9*).—This report discusses the prospects of better seed corn in Connecticut, the practical use of Mendelism in corn breeding, inbreeding in corn, some essential points in potato breeding, and extension work in agronomy. In connection with the articles on inbreeding in corn and potato breeding lists of the authors and works cited are given.

In summarizing the article on how Mendel's law may be practically applied in corn breeding, the author makes the following statement to illustrate his principal points: "Let us suppose that a yellow flint has been crossed upon a white flint, and a yellow variety is desired. The crossed kernels are planted and allowed to fertilize naturally in the field. In this season, there will appear about three yellow kernels to one white kernel. The white kernels being the recessive will breed true without further trouble. Of the yellow kernel, on the other hand, there will be one pure yellow to every two hybrid. If only yellow kernels are then planted and a number of resulting ears are self-fertilized, then, wherever a pure yellow kernel has been planted by chance, the kernels of its self-fertilized ear will be pure yellow and will ever after breed true to yellow. The same thing is true of the other dominant characters."

In treating the subject of inbreeding in corn the author reviews the opinions of different investigators, including Shull, who also recently published a paper on the subject, and points out some of the results obtained at experiment stations. The author believes that when the results of inbreeding corn by artificial pollination are not as favorable as those secured by natural pollination this does not necessarily mean that this has been entirely due to inbreeding. He states that in his first year's work with artificial corn pollination he secured poor ears upon both crossed and self-fertilized plants, but in succeeding years he obtained excellent ears by artificial pollination both when the ears were crossed and when they were self-fertilized. Rows grown from ears self-fertilized for 2 or 3 generations were exceedingly uniform in all of their botanical characters, the plants were perfectly healthy and normal, and the

only difference in favor of the crossed rows was the yield. The author further points out that several types of corn plants always appear in the breeding plat, and as these types are intercrossed there are always some of the rows from such crosses so vigorous that they are selected because of the yield and that therefore the odd type remains. In 1905, in a breeding plat of Stowell Evergreen sweet corn two types, one with a smooth full kernel and the other with a thin peaked kernel, were observed. In 1906, some ears of the same type were planted side by side so that they were intercrossed. In 1907, a part of the ears of each type were planted so that they would be fertilized by the same type and a part so that one type would pollinate the other. The rows were selected by yield only and, in every case but one, rows in which the two types had been crossed were the ones selected.

The results of several experiments and investigations made at the station are reported in an article on potato breeding. It is shown that potato varieties may be arbitrarily divided into those the buds of which drop off without opening, varieties in which a few flowers open but immediately fall, varieties the flowers of which persist several days but rarely produce viable pollen, and sorts which under most conditions always produce viable pollen. Of 721 varieties under observation, in 67 per cent the buds fell off before opening, and in about 70 per cent of the remaining varieties the flowers remained on the stems for more than one day. In unselected 2-year old seedlings the percentage of varieties retaining their flowers and those the buds of which fell off was about the same as in named varieties.

In experiments to test the efficiency of stimulating seed production through prevention of tuber formation by removing the earth from around the stolon, it was found that there are characteristic differences in seeding power which are inherited by different varieties and that the fluctuations in these characters are large and may be increased artificially by changing environmental conditions, but that no ordinary treatment will force a variety across its critical point into another biotype. From these results it is concluded that there is no reason to believe that artificial treatment can sufficiently change the natural tendencies of varieties the buds of which fall off to allow their being used as parents in originating new varieties.

It was found that the flowers most easily crossed are not those at the upper end of the plant stem but those at the next lower axils. Of such pollinations on naturally seeding varieties 52 per cent were successful, while of those on the uppermost cymes 28 per cent and of those on the lowest clusters only 18 per cent formed fruit.

A microscopical examination of pollen of different varieties showed a great variation in the character of the pollen produced by each, in addition to considerable fluctuation within the variety. Normally healthy pollen is described as round and about 0.036 mm. in diameter and pollen not producing tubes as seldom over 0.02 mm. in diameter and shriveled and irregular. Pollen grains with a number of slight protuberances were the first to germinate when placed in a 7 per cent sugar solution, and the pollen tubes grew faster and appeared stronger than those from the round grains. A pollen tube germinated from each of the protuberances, showing that several nuclei were present.

From the results of a study to determine the relation between amount and viability of pollen, it is concluded that the percentage of viable pollen should be about 50 and that it is useless to attempt using a variety of which less than 25 per cent of the pollen will grow. No fruit was obtained from varieties producing no multi-nucleate pollen grains, and of those varieties producing fruit with fair readiness all but one yielded above 16 per cent of this kind of pollen. It was observed that in general if less than 50 per cent of the ovules are fer-

tilized the seed berries are dropped in less than 8 days after fertilization, and it is concluded that the persistency of the berries increased directly with an increased percentage of fertilized ovules. A summary of the procedure in hybridizing potatoes is given.

In a study of the correlations between characters, round and oblong shapes, deep and shallow eyes, rough and smooth skins, tall and dwarf plants, and colored and uncolored stems were compared in good pollen and poor pollen varieties. Out of the correlation tables constructed only four showed correlations higher than the probable error, and these were all correlations where color is manifested on different parts of the plant.

The suggestions regarding extension work in agronomy contain outlines of 4 fertilizer experiments, 4 experiments with leguminous crops, 3 in seed selection, and 2 with varieties.

Corn breeding in Minnesota, C. P. Bull (*Minnesota Sta. Bul. 107, pp. 177–256, figs. 45*).—The possibilities of corn improvement in Minnesota are discussed, the need of such work is pointed out, and detailed directions on the methods of corn improvement followed at the station are given. Some of the more important subjects discussed are lack in uniformity of type, pollination and formation of ears, factors influencing yield and quality, principles of breeding, the breeding plat, the registry system, the pedigree chart, and the score card.

Plant breeding for farmers, H. J. Webber (*New York Cornell Sta. Bul. 251, pp. 291–332, figs. 10*).—This bulletin discusses simple methods of plant breeding suitable for the general use of farmers. Some of the factors of plant breeding such as pedigree breeding, variations, principles of selection, transmitting power, control of parentage, and record keeping are described, and methods in detail for breeding corn, wheat, oats, barley, and potatoes are presented.

Cereal production of Europe, F. R. Rutter (*U. S. Dept. Agr., Bur. Statis. Bul. 68, pp. 100*).—This bulletin contains the results of an investigation of the conditions attending the production, supply, and consumption of grain in Europe. The statistics of acreage and production and of imports and exports are given for each country covering a period of 20 years, and the statistics relating to the main progress or decline of grain culture in each country are also presented. The inadequacy of the surplus of eastern Europe to supply western Europe, the extent as well as the limits of grain culture in Europe, and the relation of the grain area to arable land are discussed, and statistics are given to point out existing conditions. Notes and statistics are also given on the average yield of grain, the average size of holdings, and the acre value of crops.

European grain trade, F. R. Rutter (*U. S. Dept. Agr., Bur. Statis. Bul. 69, pp. 63*).—This bulletin presents the results of a thorough investigation of the conditions attending the importation and exportation of grain in Europe during a period of years. The imports and exports of cereals for each country, in nearly all cases covering the period from 1883 to 1905 or 1906, are shown in tables. Brief explanations of the data are given and special features of the cereal trade of each country are pointed out. There are also general notes on the grain deficit in western Europe and on the countries of surplus production.

HORTICULTURE.

Report of the horticulturist, M. J. Iorns (*Porto Rico Sta. Rpt. 1907, pp. 20–30, fig. 1*).—The work for the past year was largely in continuation of work previously reported (E. S. R., 18, p. 1044) and consisted of cultural and variety tests of economic fruits and vegetables. Several new lines were outlined both for the station and for cooperating planters, some of the more important of which are cover crops, treatment of pineapple plantings after the second year,

stock resistance to "mal de goma," effect of stock on scion, pruning, and plant selection and breeding for special purposes. A detailed statement is given of the work being done or planned in the various lines.

In order to emphasize the former work by the station, experiments are being carried on to determine more definitely the special growth seasons for different classes of vegetables. Some of the points thus far brought out from this work are that such vegetables as radishes and lettuce with proper culture grow well at all times of the year, except in periods of excessive rainfall; that many others do have certain seasons in which they grow best; that these seasons are usually during the early winter and spring months; that the insect pests and diseases are, in a large measure, periodic; that tomatoes, melons, cucumbers, and some others can be grown in Porto Rico for a winter or spring market; and that good seed of many classes of vegetables can be home grown and the better native varieties readily improved.

Among the orchard fruits giving promise of sufficient merit to warrant further investigations are the Japanese persimmon, the Peen-to peach, the cherimoyer, the loquat, and several of the imported guavas. With a view of studying in detail cultural methods, diseases, and various other problems of fruit growing, several new plantings have been made, including a new citrus grove and a cacao grove, with rubber for shade, as well as miscellaneous plantings of cocoanuts.

Notes are given on the work with cocoanuts, rubber, mangoes, bananas, and pineapples, as well as brief notes on several miscellaneous fruits, including the Barbados cherry, Otaheite gooseberry, anona, rose apple, guava, avocado, and cacao.

A large number of standard varieties of grapes have been introduced and have made an exceptional growth during the year. It is found that heavy pruning can be done without apparent injury while the vine is in full growth. Pruning semidormant vines caused severe bleeding. By 1 or 2 heavy prunings at the proper time and pinching the buds before the growth fairly begins, it is possible to keep the vines in good bearing condition. Several new varieties of strawberries are being tested, some of which have stood the adverse conditions of drought and excessive rains and give promise of producing excellent fruit. The crop is not heavy at any one time, but the bearing period lasts over several months.

In the cooperative fertilizer experiments, in all the soils thus far tried a complete fertilizer has given a marked increase in growth over no fertilizer or one composed of 1 or 2 elements only. In no case has there been less than from 10 to 15 per cent gain in favor of a complete fertilizer. No injurious effects have been noticed from using chlorids or organic fertilizers in citrus groves. The "mal de goma" present in some groves seems in almost all cases to be due to too deep planting, bad drainage, or some allied cause rather than to the presence of organic matter. In the station orchard fresh manure has been liberally spread with beneficial results.

In the work in plant improvement, practically all of the standard vegetables are under observation, and all the native strains that give any promise of merit are being tested. Special emphasis is being laid on breeding disease-resistant varieties. The tomato, eggplant, cucumber, and muskmelon are being given special attention. Some of the most stubborn diseases, like wilts and mildews, can be overcome by breeding and selection. With choice eggplants grafted on native wild eggplants, the grafts seemed proof against disease and the fruits were large and of excellent quality. The plants bore several successive crops and were destroyed only by a newly appearing insect, which did the damage

before it was discovered. Wild eggplants are also being used as a stock on which to graft tomatoes, with considerable success. A native strain of muskmelon of large size has been found with merit enough to warrant further work. With the use of fertilizers these melons have been grown to a large size and retain an excellent flavor. Another type, locally known as "melón de la China," has been found to rank well with the Rockyford in size and flavor and to excel it in appearance. This melon is to be further tested relative to its shipping qualities, size, productiveness, and flavor. Spanish onions have been planted and will be grown from seed with the view of determining whether they keep better than those grown in the United States or in the Bermudas. An excellent and extra early strain of cowpeas has been developed, and seed is being raised for trial at other points in the island. The breeding crops thus far have matured in from 63 to 68 days.

Influence of "bottom heat" in forcing cucumbers, J. G. Moore (*Wisconsin Sta. Rpt. 1907, pp. 355–364*).—An account of an experiment in forcing cucumbers which has been conducted by the station for the past 3 seasons, the chief object of which was to determine the soil temperature best suited to the production of the crop irrespective of cost. Other factors studied were earliness, relative number of male and female flowers, and relative effect on growth and vigor of plants. Eight benches of plants were grown, 3 each in 1905 and 1906 and 2 in 1907. The range of temperatures from lowest to highest during the entire period was from 68.7° to 83.3° F.

From observations made and data secured during the 3 years, it is concluded that a soil temperature of approximately 74° gives a greater fruitfulness during the same length of time than temperatures ranging either much higher or much lower. Increase in soil temperature increases the earliness of production little if any. Variation of soil temperature shows little influence on flower production, the important factors in this respect being sunshine, atmospheric temperature, and individuality of plants. Higher soil temperature shortens the fruiting period of the plants, and the author believes that the length of fruitfulness in the cucumber is inversely proportional to the amount of soil temperature, within the limits of temperature usually given in producing this crop. The advantages gained by higher soil temperature are not sufficient to warrant the additional cost. Plant individuality is so marked that better results can be obtained by using seed from the best individuals rather than by attempting to influence production by increased soil temperature.

Cranberry investigations, A. R. Whitson and O. G. Malde (*Wisconsin Sta. Rpt. 1907, pp. 302–308, fig. 1*).—A further report on the cranberry investigations being conducted at the station and which have been reported on from year to year (E. S. R., 18, p. 1047).

The general results of the season's investigations further emphasize the influence of drainage and sanding on soil temperature. The observations relative to soil and air temperatures at different depths and heights are to be published in detail in the future. The results secured for the past 4 years relative to the influence of deep, shallow, and absence of drainage on the yield of berries are tabulated and indicate a considerable benefit from drainage. On the plat where the water was held at the surface, the average number of barrels of cranberries secured was 32, whereas on the plat drained to a depth of 14 in., the average number of barrels secured was 39. The roots on the better drained plat showed a tendency to extend deeper and were stronger than those on the undrained plat. Relative to the sanding of plats, it appears that the application of 2 in. of sand at one time on vines already established is very detrimental, as the runners are covered too deeply to prevent the rapid development of more runners. About ½ in. of sand applied to ground already well covered is found to be beneficial.

A table is given showing the yields of cranberries secured on the various fertilizer plats during the period from 1904 to 1907, inclusive. The treatments which have been most beneficial are combinations of phosphate and nitrate and of potash and nitrate. Two cooperative fertilizer tests have been made with growers during the past 2 seasons, the experiment consisting of an application of acid phosphate, sodium nitrate, and potassium sulphate, each alone and in a combination of 2 on areas of one-tenth acre, except that on one of the bogs potash and nitrate were not used singly. The yields of berries together with the treatments are given, although no conclusions are drawn as yet from the work.

A number of plats planted at the station in 1904 produced fruit and gave some indication of the results of different methods of planting as well as the comparative value of a few of the standard varieties of berries. Of 3 plats set with short cuttings by the use of a disk, as described in a previous bulletin (E. S. R., 16, p. 975), the native varieties yielded at the rate of 10 barrels per acre, the Palmeter variety 17 barrels per acre, and the Howe 12 barrels per acre. Another plat, planted with vines from the nursery in 1905 and set with a dibber in rows about 5 in. apart and 1 to 2 in. between vines in the row, yielded at the rate of 26 barrels per acre. McFarland vines planted in 1904 on unsanded peat yielded about 1 barrel per acre.

As a result of work in the moss-killing tests, the application late in May of 2 barrels of air-slaked lime per acre is recommended. This application may be repeated the second year, but the third application should be deferred for at least a year. While this treatment is suitable for sphagnum moss, wood moss is not killed by the lime, and experiments were made to establish some treatment for killing wood moss. Dry salt was first used, but could not be applied in sufficient amounts without injury to the vines. During the past year the salt was applied in solution, giving excellent results. "The application of a mixture of 15 pounds of common salt to 50 gal. of water at the rate of 4 barrels to the acre just before the opening of the terminal buds of the cranberry vines has been found safe and effective for killing the wood moss, which at that time grows rapidly." A second growth of moss usually occurs in the latter part of September and should be given a second application of the treatment at that time.

The relation of weather to the setting of fruit; with blooming data for 866 varieties of fruit, U. P. Hedrick (*New York State Sta. Bul. 299, pp. 59–138*).—In the first part of this bulletin considerable data are given together with references drawn relative to the behavior of fruit crops during the varying weather conditions of past seasons in western New York. Killing frosts, rain, temperature, sunshine, and wind are all discussed in their relation to the setting of fruits. The data are largely based upon a study of the printed records of the fruit crop of the above region found in the Proceedings of the Western New York Horticultural Society, together with an examination of crop reports, weather records, and the agricultural papers for the period under discussion. In connection with the discussion meteorological data, compiled from the records of 96 weather stations in New York, are given for the month of May for the years 1897 to 1906, inclusive.

The author points out that although self-sterility with lack of cross-pollination may be an important cause of the failure to set fruit, unfavorable weather conditions during the blooming period are also important factors in the loss of fruit crops. The conclusions reached from this investigation are that frosts, rain, cold weather, and cold or high winds are the chief agencies in preventing the proper setting of fruit in New York. The damage in the case of light frosts may be prevented to some extent if the proper precautions are taken. Abundance of sunshine and a low percentage of humidity give the most favorable con-

ditions for the setting of fruit. The orchards should be located with reference both to general and to local climate. Varieties of fruit may be selected with reference to time of blooming and with reference to their ability, from one cause or another, so to withstand injurious weather as to escape in some degree injurious climatal agencies. Cultural treatment to induce strong vitality probably helps plants to withstand stresses of harmful weather. The climate changes in short cycles, but such oscillations are not permanent, and it is probably beyond the power of man to change the climate by flooding, draining, planting or destroying forests, etc.

Blooming time is next briefly considered relative to the influences tending to hasten or retard its advent. The dates of blooming for 866 varieties of fruit, including the apple, pear, peach, plum, cherry, and grape, are given. The data were taken from the station orchards and are given for the years 1902 to 1907, inclusive, for the tree fruits and for the years 1892 to 1898 for the grape. The dates are those of the first open blossoms and the full bloom and were taken from trees grown under normal conditions as to pruning, distance apart, and other factors which might influence the blooming period. An examination of the list shows that under normal conditions and during the average season, varieties of any one species overlap sufficiently for the purpose of cross-pollination, with the possible exception of the very early and the very late varieties.

Relative to the belief that early varieties bloom earlier than late ones and that late varieties are less liable to have their blossoms injured by late frosts, the author concludes, after a study of the varieties for which blooming dates are given in connection with the period of ripening given for the same varieties in fruit manuals, that there is no correlation between blooming and fruiting, although there are many apparent exceptions.

The average of data taken for 5 years shows the length of time the several fruits are in bloom as follows: Apples, 9 days; peaches, 8 days; pears, plums, and cherries, 7 days; and grapes, 10 days. The actual length of the blooming period may vary considerably under different weather conditions. An inspection of the dates of blooming of all the fruits shows a variation of several days in most seasons between the appearance of the first blossoms of the different varieties, which can be taken advantage of in selecting sorts to avoid injury from frost. A list is also given showing early and late blooming varieties of apples, pears, peaches, plums, and cherries.

Pruning fruit trees, W. S. Thornber (*Washington Sta. Popular Bul. 3, pp. 4, figs. 8*).—This bulletin contains popular directions for pruning apples, pears, sweet cherries, and peaches.

Notes on the avocado fruit, O. Loew (*Porto Rico Sta. Rpt. 1907, pp. 18, 19*).—A detailed description of the avocado, with a brief note on a study made relative to the softening of the fruit.

Repeated shipments to New York have failed on account of the decay of the fruits, attributed to injuries to the skin, permitting the entrance of fungi. The author found, however, that where perfectly healthy fruit without any injury and with the stem still attached were selected and kept at 35 to 40° C. in a thermostat, the skin commenced to turn brown after 4 days. Two days later the fruit was soft and the skin had begun to shrink. After another 2 days the entire skin was deep brown and showed considerable and irregular shrinkage. The flesh was found to be discolored and sour, but neither microbes nor mycelium were observed. It is believed that not even the most careful packing proposed will stop these changes, but cooling with ice will retard them.

Dry-land olive culture in northern Africa, T. H. Kearney (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 125, pp. 48, pls. 4, figs. 10*).—This bulletin contains an account of the cultivation of olives without irrigation in the vicinity of Sfax in

southern Tunis, in which region the average yearly rainfall is only 9.3 in. The drought-resistant variety of the olive that is grown in Tunis has been introduced with a view to establishing dry-land olive culture in the United States, and it is believed that the present work will be useful not only in directing attention to the type of tree and methods of culture that are likely to give the best results in the olive zone, but also in stimulating as well the cultivation of trees in general in arid and semiarid regions.

A discussion is given of the importance of dry-land arboriculture in ancient Africa, the climate, topography, and soils of the Sfax region, and the cultural methods employed, including propagation, clearing the land, planting, tillage, manuring, pruning, harvesting, and yields. The relation of rainfall to yields, the question of labor, and the utilization of the run-off water in olive culture in other parts of Tunis are also discussed. Only one variety of olive, the Chemlaly, a small-fruited, oil-producing variety, is extensively grown in the Sfax region. It is very productive and the fruit yields an unusually high percentage of oil. Wide planting and thorough cultivation are the most important principles of olive culture at Sfax, the trees being planted 65 to 80 ft. apart in each direction. There appears to be a relation between the yield of the olive and the rainfall of the previous year, but none between the yield and the rainfall of the year in which the crop is made.

The decay of oranges while in transit from California, G. H. Powell et al. (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 123, pp. 79, pls. 9, figs. 26*).—This is the first comprehensive report on the investigations which are being conducted by the Bureau of Plant Industry of this Department in cooperation with the California orange growers relative to the causes and control of the decay in citrus fruits while in transit to eastern markets. The investigations in general have been conducted under commercial conditions with a view to rendering the data secured of practical value in the various phases of the industry. In the experimental investigations it was sought to determine the comparative susceptibility to decay of oranges handled in different ways for shipment, including holding them in the packing houses in California for about 2 weeks, forwarding to New York at short intervals after packing under ventilation, icing, and precooling, and handling in different ways and shipping under different conditions when stored in a common storage room in eastern markets. Technical investigations in refrigeration were also conducted, including the development and testing of various methods of cooling the oranges for shipment and the determination of changes in the temperatures of cars when shipped under different methods. For a proper understanding of the work under discussion, a general account is given of the California citrus fruit business relative to its extent, location, cultural conditions, and methods of picking, packing, and shipping.

The preliminary survey of the winter of 1903–4 showed that the decay varied in extent in different regions and in different packing houses in the same region and that it usually increased in severity as the season advanced. As has been previously noted in a preliminary account of the work (E. S. R., 17, p. 663), it was found that the decay was caused by a blue mold fungus, which enters the orange through mechanical abrasions in the skin. A systematic series of observations and inspections was started in 1905 to determine the amount and severity of mechanical injuries of oranges when delivered to the packing houses and the relations of the methods of handling the fruit to these injuries, and a variation commonly running from 1 to 50 per cent was found in the amount of injury in the fruit of different pickers, growers, and packing houses. Largely as a result of this investigation the relation between mechanical injury to the orange and the chance of decay during shipment is now generally under-

stood by growers and packers, and a determined effort is being made to reduce the trouble. Abundant data have been accumulated to show that with care in instruction and supervision of labor not more than 2 or 3 per cent of the oranges will be injured in handling the fruit on a large commercial scale.

With the oranges handled in different ways and held in the packing houses in California for about 2 weeks previous to shipment, the work of the 3 years from the standpoint of the packing house shows that the least decay develops in sound unbrushed fruit. Brushing increases decay and washing increases it still more. The greatest decay develops in mechanically injured oranges. Little difference was noted in the amount of decay in oranges grown in different sections and handled in the same manner or in oranges picked from the same grove with equal care at different periods from January to May. Curing the orange for a few days before packing wilts the skin and in the early part of the season renders it more pliable. While this process is probably not harmful to uninjured fruit, the blue mold begins to develop more or less in the injured oranges during the curing period, according to the severity of the injury. When fruit is packed promptly after picking and shipped at once in a cool temperature the decay may not develop in transit. Brushing so large a proportion of the oranges as has been the custom is found to be unnecessary, and washing can be avoided by treating the groves properly for scale.

Two hundred and ninety-seven shipments of fruit were made to New York during the last 3 years. Relative to the handling of the fruit, the least decay has developed under all methods of shipment in the sound, carefully handled oranges, and the greatest amount in those mechanically injured. With regard to promptness of shipment after packing, the decay has increased proportionately with delay in shipment. As to the method of shipment the least decay developed in precooled fruit that was loaded in the cars in cold condition. When the fruit is cooled to a temperature of about 40° F. before shipment less re-icing is required en route. The boxes may also be loaded more closely than is safe under regular icing. Precooling retards decay temporarily but does not remove the cause. Decay can be avoided by handling the fruit carefully. In the market-holding tests the greatest loss occurred in mechanically injured oranges.

The temperature of the fruit was found to change slowly in transit. "In ventilated cars there may be extreme changes in the outside air, and if the extremes do not persist long the changes in the temperature of the fruit are relatively slow. In iced cars the temperature falls relatively fast during the first few days, but a train may cover one-third of the trip across the continent before the temperature of the fruit reaches 50° F. The decay develops rapidly during the early part of the trip, while the fruit is warm. In a car in which the fruit is cooled to 40° F. or lower before shipment the temperature remains nearly constant if the car is re-iced regularly in transit. In cool weather it remains fairly constant without additional icing after the car leaves California. In warm weather the re-icing during the first half of the trip can be avoided, but the car may need re-icing during the latter half of the trip."

Nomenclature of the pear; a catalogue-index of the known varieties referred to in American publications from 1804 to 1907, W. H. RAGAN (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 126, pp. 268*).—This bulletin is similar in its scope to the Nomenclature of the Apple (E. S. R., 16, p. 777) and is offered as the second of a contemplated series in which it is hoped to publish the names of all the cultivated fruits. The data collected are based on a careful study of the American literature of the pear, extending back to and including the publication of the Domestic Encyclopedia in 1804. The code of nomenclature of the American Pomological Society has been followed in the naming of the varieties.

The index is arranged in alphabetical order and consists of a fairly complete list of the cultivated varieties of pears, embracing both leading names and their synonyms, together with brief descriptions and histories of varieties, including origin, form, size, color, texture, flavor, quality, and time of maturity. An index to the American literature of the pear from 1804 to 1907 is appended.

Report of the coffee expert, J. W. VAN LEENHOFF (*Porto Rico Sta. Rpt. 1907, pp. 39, 40*).—Storms lasting continuously from November 25 to December 14, 1906, and again from March 26 to March 28, 1907, did much damage to old and young trees, especially in less protected places, and showed the necessity of many more wind-breaks. As a provisional protection plantains were planted between the rows, to be removed as soon as the shade had grown to sufficient height. Although the claim of Porto Rican planters that young coffee wants heavy shade has not been proved, it does appear that many shade trees for wind-breaks may be required.

The experiments in improving an old coffee grove were continued and the yields determined (E. S. R., 18, p. 1049). The crop from 10 acres in 1902 was 3,387 lbs. In the following year the plat was divided into 10 1-acre plats, on each of which a different method of treatment was followed, as has been previously noted (E. S. R., 16, p. 144). In all 1,106 trees were removed and the others trimmed up. In 1903 the yield from the 10 acres was in all 1,623 lbs. The yield has increased each year, and in 1906, 4,349 lbs. was secured. Full details of the experiments are to be published later in bulletin form.

The total cost of gathering and preparing 100 lbs. of coffee for market is estimated at $4.335, and the average price obtained for the same amount as $10.885. Estimates are given of the cost of the new plantings of coffee. The net cost per acre to the end of the third year was $83.70.

The fermentation of cacao and of coffee, O. LOEW (*Porto Rico Sta. Rpt. 1907, pp. 41–55, figs. 2*).—Studies were made by the author relative to the purpose and necessity of, and the kind of action involved in, the fermentation of cacao and coffee. Several investigators are cited to show that a great difference of opinion exists along these lines.

The chief purposes of the fermentation process with cacao are given as the removal or contraction of the pulp surrounding the seeds, the loosening of the connection between the seed and its testa, and the development of the color and the improvement of the taste. The action of the fermentation process in bringing about these changes is discussed.

The author concludes that the fermentation process itself is due primarily to yeast cells, which multiply rapidly in the saccharine juice oozing from the pulped cacao, or slime tissue, and produce alcohol and carbon dioxid. Bacteria also develop rapidly after a certain time and ozidize the alcohol formed by the yeast, either wholly or partly, into acetic acid. These processes cause a rise of temperature and the death of the cells of the seeds and slime tisue, whereupon the juice of the slime tissue, more or less altered, collects at the bottom of the receptacles, together with the acetic acid produced. By thus shrinking the slime tissue the quick drying of the seed is facilitated, the adhesion between the seed and its envelope is loosened, and the envelope is hardened.

Fermentation also acts indirectly in killing the seed cells, thus liberating oxidizing enzyms, which cause the formation of a brown coloration by oxidation of the tannin of the seed. This coloration is increased during the drying process and finally by the roasting. The taste of the raw cacao bean is not only altered by the partial oxidation of tannin during the fermentation or sun drying of the seed, but also by products of roasting. Both the oxidizing enzyms and the final roasting process assist in developing the aroma.

The fermentation of coffee was also investigated, and the author comes to the conclusion that the alcoholic and acetic fermentations are of only indirect benefit, inasmuch as heat is thereby produced which supports the action of a body (enzym) furnished by the bacteria, which dissolves the adhesive substance between parchment envelope and slimy layer.

From 15 to 20 hours is considered sufficient for the fermentation of coffee in Porto Rico, while in some sections of Central America, as Guatemala, it must be carried on for 2 days. Undue prolonging of the fermentation causes a brown coloration of the parchment and of the seeds. The latter also acquire a disagreeable odor.

FORESTRY.

Forests (*Bibliogr. Nat. Suisse, 1907, No. V 9c, Sup., pp. VIII+151–231*).—This is a supplement to a catalogue published in 1894 of literature dealing with the various phases of Swiss forestry. The present supplement comprises a complementary list of works published from 1800–1892, together with the forestry literature from 1893–1900. The scope of the literature is broad, including forest zoology, botany, soil and climatology, instruction, experiments, history, societies, biographies, commerce, statistics, expositions, surveys, management, taxation, administration, politics, and sylviculture. The work is arranged in chronological order and is accompanied with an alphabetical index.

Yearbook of the administration of government and funds property, A. Heidler (*Jahrb. Staats u. Fondsg. Verwalt., 6 (1907), pp. V+263, pls. 6, figs. 47*).—Tabular data are given relative to the constitution and areas of the government and various endowment estates in the different provinces of Austria for the period 1894–1905, inclusive, together with a summarized report on the revenues of these estates for the period 1899–1903, and comparative data of the revenues obtained in the period 1874–1903. Detailed tabular data are also given showing the production of the various forest products, sylvicultural operations, and forest management for the period 1899–1903. Concluding articles deal with an account of the work in combating the nun moth (*Lymantria monacha*) in the Niepolomice principality from 1891 to 1902 by W. Sedlaczek, and an account of forestry operations conducted under the direction of the administrator of the estates of the Bukowinaer oriental religious funds in Czernowitz by J. Opletal.

A statistical review of the forest administration of the Grand Duchy of Baden for the year 1905 (*Statis. Nachw. Forstverw. Baden, 28 (1905), pp. XX+123, dgms. 9*).—A statistical report for the year 1905 of forest areas, planting and cutting operations, yields, and revenue from various forest products in the Grand Duchy of Baden for the year 1905, together with comparative data for the period from 1878 to 1904.

Progress report of forest administration in Baluchistan for 1905–6, S. Singh (*Rpt. Forest Admin. Baluchistan, 1905–6, pp. 41*).—The usual annual report on the forest operations in Baluchistan for the year 1905–6, including notes and tabular data dealing with the constitution and areas of State forests, forest surveys, preparation of working plans, protection from fire, sylvicultural operations, exploitations, and financial results.

A brief report of similar nature is given by E. H. S. James for the Zhob district for the year 1905–6.

Trees and their life histories, P. Groom (*London and New York, 1907, pp. XVI+407, pl. 1, figs. 317*).—A popular account and description of all the more important trees of Great Britain, including analytical tables, diagnosis of families, and numerous illustrations showing the various tree types, structure of the bark and new growth, flowers, and fruits. An explanatory introduction

is given, dealing with the activity and nourishment of trees and a study of the various tree organs, classification, and nomenclature.

The commercial forest trees of Massachusetts, D. A. CLARK (*Boston, 1907, pp. 66, figs. 76*).—This pamphlet, which was prepared by the author under the direction of F. W. Rane, State Forester of Massachusetts, is offered by that State for free distribution with a view of presenting a practical working description of the commercial trees of Massachusetts.

The more important characteristics and distinguishing features of each species are given, together with a brief account of their distribution, range, habit of growth and form, with figures illustrating the winter twigs, leaves, and fruit.

Forestry from a commercial standpoint, F. W. RANE ([*Boston*], *1907, pp. 16*).—A lecture on this subject delivered by the author before the Massachusetts Horticultural Society, and which is here presented in pamphlet form for general distribution to Massachusetts citizens. The subject matter deals particularly with conditions in Massachusetts and several estimates are given showing the profits to be derived from woodlands under present conditions in that State, including second growth white pine, chestnut, and sprout hardwood growth, as well as planted woodlands.

Practical results in basket willow culture, C. D. MELL (*U. S. Dept. Agr., Forest Serv. Circ. 148, pp. 7*).—In this circular results are given of 2 years' tests at the willow holt of the Forest Service, located on the Department experimental farm at Arlington, Va., in growing standard European basket willows under different methods of management. The varieties tested include Welsh or purple, Lemley, patent Lemley, and American green or almond, and have been described in a previous bulletin (E. S. R., 16, p. 161).

Tests were made on two phases of willow culture, spacing and cutting. The results are presented in tabular form and discussed. The following important facts were brought out by the experiments: Wide spacing was found greatly to decrease the number and total weight of rods for a given area and to increase the weight of individual rods; close spacing greatly retards the growth of weeds; spacing has little effect on the proportion of bark to wood or on the length of the best rods, but wide spacing lowers the production of unbranched rods; cutting below the surface of the ground lowers the quality of the rods and decreases the productivity of the stools.

Large samples of bark from all the willows on the experimental farm were analyzed by the Bureau of Chemistry of this Department. The tannin content was found to be comparatively large, ranging from 8.75 per cent in the Welsh variety to 11.38 per cent in the American green, from which it is concluded that willow bark may prove a valuable source of tannin. Brief suggestions are also given relative to the marketing of willow rods.

Yield tables for the spruce and beech of Switzerland, P. FLURY (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw., 9 (1907), pp. VII + 290 + 55, pls. 7, map 1*).—The yield tables here presented are based upon statistical data collected from 356 pure stand experimental areas of spruce and of beech established and directed by the Swiss forestry experiment station and located in various State, communal, corporation, and private forest areas in the hill lands and mountain regions of Switzerland. The first of these experimental areas was established about 18 years ago, and most of them have been thinned for the second or third time.

The first part of the work is devoted to a detailed account, with explanatory tables, relative to the individual experimental areas and methods of gathering the data. Parts 2 and 3 contain detailed tabulated descriptions, and various felling results of the individual experimental areas, together with computed yield and accretion tables for different age and quality classes of spruce and

beech. In the case of the spruce, separate sets of tables are given for the hill lands and mountain areas since the various relations for this species differ considerably in the two regions. Only one set of tables is given for the beach, which species shows practically the same development in both regions. Part 4 discusses the principal results derived from the statistics, together with the application of the yield table.

In an appendix the separate experimental stands are classified relative to the diameter and yield per hectare of stems at the time of the first felling and according to the quality of the locality. A map is given showing the location of the various experimental areas, as well as a catalogue of the yield tables for various species of trees published since 1872, and of all works published since 1881 dealing with the arrangement, testing, results, and investigations in connection with yield tables.

Progress in chestnut pole preservation, H. F. WEISS (*U. S. Dept. Agr., Forest Serv. Circ. 147, pp. 14, figs. 2*).—This circular discusses a number of points relative to pole preservation not brought out in the former publications of the Forest Service on similar subjects (E. S. R., 19, pp. 243, 952), and is based largely upon the results of a series of experiments conducted at Parkton, Md., from August, 1905, to June, 1907, in cooperation with the American Telephone and Telegraph Company.

A comparison of poles cut from sprouts and seed trees showed practically no difference in the taper, but the sprout-grown poles are stronger and hence safer under strain. Furthermore, they require a shorter rotation, thus giving quicker and larger returns on the investment.

The poles were preserved by the brush and open-tank treatments. Under the brush treatment the penetration of carbolineum and creosote was about equal and averaged about one-eighth of an inch. Creosote alone was used in the open-tank treatment, and special studies were made of the effects of long soaking in hot oil and of a rapid change from hot to cold oil, and as to whether poles soaked in water and then seasoñed take better treatment. The conclusion reached is that the sapwood of chestnut, which is a thin layer, should be completely saturated with the preservative. This can be accomplished by heating the poles in oil for 6 hours and leaving them in the cooling oil over night, or by heating them in hot oil for 4 hours and plunging them into cold oil for 2 hours. Soaking poles in water preparatory to preservative treatment is not recommended, since no better absorption or penetration of the oil is obtained thereby. Effectiveness of treatment is independent of the season of cutting, but depends directly upon the moisture content and the width of the sapwood. Chestnut poles cut during the period of maximum rate of diameter growth and thoroughly seasoned admit of best results in preservative treatment. Poles cut in spring and summer reach such a condition more quickly than those cut in autumn and winter.

A table is given showing the length of seasoning period desirable previous to preserving for poles cut at different times of the year. Defects such as cup shakes, frost cracks, or splits from careless cutting may cause serious damage, especially in spring-cut and summer-cut poles. It is advised that such poles be immediately treated with S-irons to prevent them from splitting.

Experiments with railway cross-ties, H. B. EASTMAN (*U. S. Dept. Agr., Forest Serv. Circ. 146, pp. 22, fig. 1, dgms. 2*).—An account is given of an investigation conducted in cooperation with the Northern Pacific Railroad to determine the best and most economical methods of handling tie timbers accessible to that road when manufactured into cross-ties. The timbers used in the experiments were Douglas fir, western hemlock, western tamarack, and giant arborvitæ, and the work was conducted along 3 lines, as follows: Tests to

determine the green weight and rate of seasoning of timbers cut in different months, tests to determine the absorptive power of seasoned timbers cut in different months, and tests to determine the comparative durability of green, seasoned, and treated timbers when laid under similar conditions and with various tie-plates and rail fastenings in a test track. The seasoning and preservative tests, which were conducted at Tacoma and Pasco, Wash., and Sandpoint, Idaho, are described and the results are tabulated and discussed.

The general conclusions reached are that there is practically no difference in the rate of seasoning of 7 by 2 and 8 by 1 forms of piles. The rate of seasoning, as affected by the position of the pile, depends largely upon local conditions.

Hewed ties peeled when cut season much more rapidly during the first 4 months than unpealed ties. The weights of both peeled and unpeeled ties, however, are approximately uniform after a year's seasoning. The oven-dry weight of Douglas fir was 28.3 lbs. per cubic foot, the green weight varying from 41.7 lbs. in February to 37 lbs. in July. The minimum air-seasoned weight reached was 31.9 lbs. per cubic foot.

Two kinds of checks were observed in the timber—radial and small honeycomb. The honeycomb checks were found to cause little damage to the tie, while radial checks are very destructive and often make the tie unfit for service. It is advised that the practice of cutting tie and bridge timbers from Douglas fir and western hemlock during June, July, August, and September should be discontinued, since radial checking is particularly serious during those months. Dimension material over 6 by 6 in. should be partially air seasoned before being shipped east of the Cascade Mountains.

Hewed ties peeled directly before treatment absorb more preservative than those peeled when cut, provided they have seasoned for an equal length of time.

A large number of green, seasoned, and treated ties have been placed in test tracks, one on the west slope of the Cascade Mountains, near Maywood, Wash., and one in western Montana, near Plains. The nature of these tracks is described and illustrated and the scheme of the tests to be conducted is given.

Forest products of the United States, 1906 (*U. S. Dept. Agr., Forest Service Bul. 77, pp. 99*).—This bulletin contains statistical data for 1906 relative to the lumber cut of the United States, the consumption of cross-ties, pulpwood, tanbark, tanning extract, and poles, the production of tight and slack cooperage stock, veneer, and wood used for distillation.

The statistics for each of these products have been previously issued in separate circulars, which are noted (E. S. R., 19, pp. 748, 848, 950).

Wood pulp in Norway, F. S. S. Johnson (*Daily Consular and Trade Rpts. [U. S.], 1907, No. 3062, pp. 9, 10*).—A brief statistical review of the wood pulp industry of Norway. Tables are given showing the quantity and value of wood pulp produced at various periods from 1869 to 1906, as well as the share of the product taken by each country in 1906. The production increased from 60 tons in 1869 to 505,627 tons in 1906, which consisted of mechanical wood pulp, dry, 13,059 tons, and wet, 362,228 tons, chemical wood pulp, dry 122,923 tons, and wet, 7,417 tons. Great Britain, France, and Belgium are the largest buyers of Norwegian pulp wood.

Data are also given relative to the forestry resources of Norway.

The resinous products of the Dipterocarpaceæs of Indo-China, E. Milliau and C. Crevost (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 63, pp. 381–403*).—A key is given to the genera and species of the Dipterocarpaceæ family, including the species of Dipterocarpus, Hopea, Shorea, and Anisoptera, which produce resinous products used in the manufacture of varnish, furniture polishes, etc. The key is prepared for the benefit of exporters and manufacturers. The local and botanical names of the different species are given, together with notes on

their habitat and the nature of the product which they yield. The more important products are resin oil, commonly known as wood oil, damars of Batavia, and copal.

Bamboo as raw material, W. RAITT (*Paper Making, 26 (1907), Nos. 11, pp. 502–508; 12, pp. 539–541*).—This paper, which originally appeared in *Paper Mill*, contains a general discussion as to the probable importance of bamboo as a source of wood pulp, together with notes on laboratory tests made by the author in the production of wood pulp and observations on the growth and behavior of bamboo under various systems of cropping, with estimates on the average weight of the material which might reasonably be expected annually from a given area under rational systems of culture.

The results of the author's experiments in the production of wood pulp from bamboo indicate that the use of 2 or 3-year old growths appears to be the most economical and to differ very slightly in the results. It is concluded that cropping every third year, when the stems are from 28 to 34 months old, will secure an absolute permanence of growth. In making paper pulp the nodes must be removed from the bamboo cane. Fifteen tons of canes per acre every third year is given as the dependable crop to be realized from poor to moderate bamboo stands. According to data secured from laboratory tests it is estimated that 5 tons of air-dry bamboo will produce at least 45 per cent or 45 cwt. of unbleached pulp.

Rubber cultivation in the British Empire, H. WRIGHT (*London, 1907, pp. VII+100, pls. 4*).—A lecture on this subject delivered before the Society of Arts. Introductory considerations deal with the importance of rubber cultivation and the development of the rubber market, including tabular statistics showing the consumption and value of rubber from 1899 to 1906, the relative importance of India rubber, Balata, and gutta-percha, and the capital invested in rubber companies.

The author discusses the various geographical and botanical sources of caoutchouc, briefly describes the important rubber-producing species and varieties, and gives a general account of the development of wild and plantation rubber, with special reference to rubber cultivation in the British Empire. The differences between the laticiferous systems of different genera is discussed, the methods of tapping, collecting, coagulating, and the manufacture of rubber are described, and data are given on yields secured under various conditions. Notes are also given on numerous slides shown at the lecture.

Caoutchouc and gutta plants, H. JUMELLE (*Les Plantes à Caoutchouc et à Gutta. Paris, 1903, pp. XII+542, figs. 57*).—This work is designed to supersede one published in 1898 on the caoutchouc and gutta plants in the French colonies. The present volume has been revised and enlarged with a view of including all the tropical countries where rubber is produced and presenting the more recent information collected on the subject of rubber culture.

Part 1 deals with plants producing caoutchouc, which are discussed in a general way relative to their history, the chemical and physical properties of the rubber and latex, and methods of harvesting and coagulation, after which the important caoutchouc-producing species and varieties are taken up, including their geographic distribution, botany, exploitation, yield in latex and rubber, cultivation, etc. Part 2 deals with plants producing gutta.

India-rubber and its manufacture, H. L. TERRY (*London, 1907, pp. VIII+294, figs. 18*).—This volume is designed for the general reader and the technologist in other branches of industry, with a view to furnishing information relative to the natural history and manufacture of rubber. A brief general and historical account is given of the rubber industry, together with the botanical origin of raw rubber, methods of tapping, coagulation, and principal raw

rubbers of commerce. Succeeding chapters deal with the chemical and physical properties of rubber, vulcanization, India-rubber plantations, India-rubber substitutes, reclaimed rubber, washing, drying, and compounding of rubber, rubber solvents and their recovery, rubber solution, and the various forms of manufactured rubber and the articles made therefrom. Concluding chapters treat of the production and uses of gutta-percha and balata. A brief bibliography is also given of publications dealing with the various phases of rubber cultivation and manufacture.

DISEASES OF PLANTS.

Report of the botanist for 1907, G. P. Clinton (*Connecticut State Sta. Rpt. 1907–8, pt. 6, pp. 339–396, pls. 16*).—General notes are given on a number of diseases of plants that have been previously reported and short accounts presented of a number that have not hitherto been reported as occurring in this State.

The diseases new to the State are taken up under an alphabetical list of host plants, and among the number, attention is called to the blight of the white pine, which, it is said, has been one of the most conspicuous diseases of the year, occurring not only in Connecticut but over most of New England. This disease has been attributed to various causes, but the author thinks the trouble a physiological one, induced by adverse conditions. In some cases winter injury was probably the cause of the trouble, while in others it was apparently due largely to drought and late frosts.

Notes are given on the internal brown spot of potatoes, a diseased condition that proved rather troublesome in potatoes that were imported from Scotland for experimental purposes at the station. The occurrence of scurf on potatoes, due to *Spondylocladium atrovirens*, is also noted.

An account is given of a disease of Sumatra tobacco, which is believed to be possibly of bacterial origin. Attention was first called to this disease in Bulletin 150 of the station (E. S. R., 17, p. 136), in which it was stated that the plants were attacked by a fungus root disease. Subsequent studies seemed to indicate that the trouble may be bacterial in origin. The disease, so far as it has been noticed, has been confined to seed beds.

An account is given of investigations begun in 1906 on the root rot of tobacco, due to *Thielavia basicola*. This fungus, which seems to be rather widely distributed, occurring on a number of plants, has proved very troublesome both in tobacco seed beds and in the fields. Experiments with formaldehyde and steam sterilization in seed beds have given fairly satisfactory results, the steam heated plats producing the best stand, followed by those treated in the fall of the year with formaldehyde at the rate of 1 part formalin to 100 parts water. Formalin diluted and sprinkled over the plants after their growth had begun, injured the plants and resulted in a very poor stand and growth. When the convenience of treatment is considered, the author believes that the formalin treatment is an efficient and convenient method of protecting seed beds against the root rot and possibly the damping off of tobacco. Observations made of the treatment of tobacco fields for the control of this disease seem to indicate that as yet no effective treatment for use in the field has been obtained. Wherever possible the growing of tobacco in land that has become infested should be abandoned for a few years.

The report concludes with an account of studies on heterœcious rusts of Connecticut having a peridermium for their acidial stage. This is a detailed report on investigations which have been previously noted (E. S. R., 19, p. 1149).

Symptoms of disease in plants, F. D. Heald (*Ann. Rpt. Nebr. Hort. Soc., 38 (1907), pp. 231–244*).—The author describes the symptoms of a large number

of plant diseases and gives methods for recognizing their causes. Suggestions are also given for the prevention of the diseases where definite means are known.

The control of plant diseases, H. H. Whetzel and F. C. Stewart (*New York Cornell Sta. Bul. 252, pp. 349–361, figs. 15*).—Brief descriptions are given of the more important fungus diseases attacking alfalfa, apples, asparagus, beans, cabbage, cauliflower, carnations, celery, cherries, chrysanthemums, cucumbers, currants, ginseng, gooseberries, grapes, lettuce, muskmelons, oats, onions, peaches, pears, plums, potatoes, quinces, raspberries, roses, strawberries, tomatoes, turnips, and wheat, together with directions for their control.

Cultures of Uredineæ in 1907, J. C. Arthur (*Abs. in Science, n. ser., 27 (1908), No. 687, p. 340*).—A brief abstract is given of a report on the cultural work carried on by the author during 1907. Thirty species of rust were grown with success, 8 of which are reported for the first time. A rust of Allium was carried through its life cycle, and 3 sedge rusts and 2 species of Gymnosporangium, *G. betheli* and *G. inconspicuum*, were connected with their æcidial stages.

The life history of Puccinia malvacearum, J. B. Dandeno (*Rpt. Mich. Acad. Sci., 9 (1907), pp. 68–73, figs. 5*).—The author calls attention to this parasite, which is of interest on account of the fact that, so far as known, it does not produce any other stage of spores than teleutospores. On account of this peculiarity, the wintering of the fungus and its sudden spread during the late summer have been subjects of considerable study.

The author undertook a series of investigations to discover how the fungus passes the winter, in this way testing the statements of others that the disease might pass the winter in the embryo of infected seeds, or that teleutospores produced late in the season acted as resting spores and then germinated in the spring.

So far as the author's observations have gone, none of the old spores could be induced to germinate, and the author claims that the idea of teleutospores wintering the fungus over will have to be abandoned. On examining some mallows very early in the spring the fungus was found present, and it is believed that it winters over in living portions of such infected plants as withstand the winter. Its slow development in the summer is attributed to the probable fact that the temperature and moisture conditions in the latter part of the summer are best suited for its rapid development and spread.

Blindness in barley (*Jour. Bd. Agr. [London], 14 (1908), No. 11, pp. 670, 671*).—A brief account is given of the experiments carried on by the agricultural department of Cambridge University in treating barley with fungicides to prevent the attack of the disease known as blindness in barley, a disease that is caused by the fungus *Helminthosporium gramineum*.

In the first series of experiments, seeds were treated with a 10 per cent solution of copper sulphate, with formalin, with the mixture known as Sar, and by the hot-water method. The results obtained showed that the copper sulphate, while injuring the seed to some extent, was efficient in preventing the disease, and that formalin was nearly as satisfactory, the other methods being much less effective.

In 1907 formalin was again used in 2 strengths of solution, 1 part in 240 of water and 1 part in 160 of water. For the stronger solution, only 0.9 per cent of diseased plants was observed, while for the weaker solution, 2.5 per cent was found to be attacked by the fungus. The stronger solution had no bad effect upon the crop, while by checking the disease it is believed that the yield of grain was increased by not less than 25 per cent. There was also a decided increase in the proportion of heavy to light grain.

Barley smut investigations, R. A. Moore and A. L. Stone (*Wisconsin Sta. Rpt. 1907, pp. 409, 410*).—In the experiments being conducted by the authors with a view to reducing the loss from barley smut, the modified hot-water treatment was again used during 1907 with practically the same results reported for 1906 (E. S. R., 18, p. 1055). Owing to the cold weather following the seeding, some of the kernels of soaked barley failed to germinate and in some places the stand was thinner than on plats where the seed was not treated.

Data received from 99 members of the experiment association, who conducted cooperative tests in exterminating smut, show an average percentage of smut in untreated seed of 2.93 as compared with an average of only 0.65 per cent of smut in treated seed. The average percentage of the crop saved by the treatment was 2.28. Thirty reported poor germination of treated seed after sowing.

As a result of both the station and cooperative tests, it is concluded that loose smut of barley can be eradicated by the modified hot-water treatment, although the farmer is advised to treat only small areas until further tests have been made with large quantities of seed. The range of temperatures of the hot water at which the treatment will be effective without injury to the seed appears to be limited. Treated barley should be sown immediately, otherwise it will sprout. The ground should have become warm before sowing, to facilitate germination.

Observations upon the prevalence of early potato blight (Alternaria solani) in Wisconsin, J. G. Milward (*Wisconsin Sta. Rpt. 1907, pp. 343–350, figs. 6*).—The potato investigations conducted by the station for the past 4 years have shown the early potato blight (*A. solani*) to be an immediate factor in determining the annual yield of potatoes in Wisconsin. The author points out the need of a correct understanding of the nature and life history of this fungus and a clear correlation of these facts as associated with standard methods of control. The disease is briefly discussed relative to conditions leading to its development and perpetuation, and the important morphological characters of the fungus are brought out by the aid of illustrations.

Potato spraying experiments for 1907, J. G. Milward (*Wisconsin Sta. Rpt. 1907, pp. 351–354, fig. 1*).—The spraying experiments for the prevention of early blight were continued during 1907 with results similar to those reported for 1905 and 1906 (E. S. R., 18, p. 1056).

Bordeaux mixture has proved an efficient preventive where cultural conditions are suited to the growing of the crop, 5 applications of Bordeaux made during the season on each of the 3 test fields at a cost of $4.30 per acre resulting in gains per acre of 27, 30, and 52 bu. of potatoes, respectively, and net profits per acre of $7.70, $9.20, and $21.70, respectively.

The work has been extended to include observations upon blight-resistant varieties and yield tests with 3 varieties of Russian alcohol potatoes. Among the 110 varieties tested a wide variation was shown in regard to disease resistance.

Attention is called to the importance of selection and care of seed potatoes as a factor in maintaining productiveness and vigor in the standard varieties, and to the need of a closer study of the influence of weather conditions upon the prevalence of early blight in Wisconsin.

Diseases affecting rice in Louisiana, H. R. Fulton (*Louisiana Stas. Bul. 105, pp. 3–28, pls. 8*).—Four diseases of rice observed in Louisiana are considered in this bulletin, the blast, brown grain spot, green smut, and black smut.

The first disease, rice blast, is in all probability the same as that known in Italy as brusone, and also known to occur in Japan, and is caused by the fungus *Piricularia oryzæ*. The general effect of the blast is shown in the extensive

paling and drying of the leaf and stem and the poor condition of the head. The most conspicuous lesions are found in the sheath nodes just above the joints of the stem, at the region where the stem becomes the axis of the head. A fungus that does not seem to be distinguishable from the rice blast Piricularia has been found on crab grass, and it is thought probable that this host plant may serve as a source of infection for rice. The results of inoculation experiments and the conditions favoring the occurrence and spread of the disease are given. An account of preventive measures, based largely upon the experiments by the South Carolina Station (E. S. R., 18, p. 244), is presented.

Brown spot of rice grains, which is also called speck and pip, is characterized by the presence of one or more discolored shrunken areas on the grains, the typical spots being regularly circular, about $\frac{1}{16}$ in. in diameter, and bounded by a dark marginal line. The interior portion of the grain under the spot is chalky, opaque, and brittle, and the whole grain is of inferior quality. A careful examination of diseased tissues showed the presence of several kinds of bacteria and fungi and also that the center of each spot contained a minute depression such as might be caused by the prick of a fine needle. This suggested the possibility of insects being the cause of the trouble, and a study pointed to the fact that the primary cause of the disease is *Œbalus pugnax*. This insect was found abundant in the rice fields, and the bacteria and fungi present followed the injury caused by this pest.

The green smut usually affected only a few grains in a head, causing their enlargement, the fungus responsible for this trouble being *Ustilaginoidea virens*. This disease has been known in Japan for a long time, and in Louisiana it has been found on the Honduras and red rice, and less frequently on Japan rice. The life history of the fungus is very poorly known, and at present no definite means of infection have been determined. The treatment of seed with formalin or other fungicides, which have been used with success for similar diseases, it is believed would prove adapted to the prevention of this disease of rice.

The black smut, which, so far as the author's observations have gone, is confined to the Honduras and red rice, is due to *Tilletia horrida*. This may be controlled by treating the seed with any of the better known methods of seed treatment.

[**Fermentation and diseases of tobacco**], O. Loew (*Porto Rico Sta. Rpt. 1907, pp. 16–18, fig. 1*).—Brief notes on the method of fermenting tobacco and the diseases of tobacco in Porto Rico.

The author is of the opinion that the so-called after-fermentation of tobacco proceeds much more energetically in the continuously warm climate of Porto Rico than in the United States, and that it appears unnecessary in the case of the main fermentation to turn over the bulks of tobacco quite so often as in the States, although a temperature of 55 or 56° C. should be reached in each bulk the first time.

Relative to diseases of tobacco the opinion is advanced that the various troubles observed in the United States occur more or less in Porto Rico. The mosaic disease and the wilt disease do not appear to be general.

L. DuBois reports a trouble observed with the tobacco in a certain seciton of the Aibonito district, in which the tobacco several weeks after fermentation acquires such a disagreeable odor as to render it worthless. An examination of some of this tobacco showed the odor to be moldy or musty. The vines were covered here and there with a white mass and many of the stems were so rotten that they easily broke into fragments on being handled. A microscopical examination revealed no fungus mycelium, but numerous bacteria, especially cocci, as well as yeast-like cells. The disease resembles pole burn. The cause is still undetermined.

A peculiar disease, known as "sancochado" in Porto Rico, was observed in tobacco seed beds of Cáguas. This disease spreads from a center in ring-like progression. The circle of dead, bleached seedlings increasing continuously is checked only by removing the soil to some depth and treating the spot with diluted formaldehyde (1 spoonful to 30 gal. of water). A microscopical examination revealed no mycelium, but numerous active nematodes were found, which are thought to cause the disease.

The tobacco flea beetle and the changa are considered the worst enemies of tobacco in Porto Rico. The majority of the insect pests, including the cutworm, are avoided by growing the tobacco under cheese-cloth.

Peach leaf curl, I. B. P. Evans (*Transvaal Agr. Jour., 6 (1908), No. 22, pp. 259, 260, pls. 2*).—The author describes the peach leaf curl caused by *Exoascus deformans*, giving particular attention to its occurrence on nectarines and apricots. When the fungus attacks the fruit of the nectarine it becomes covered with wart-like growths, while apricots are arrested in their development so that they never attain more than half the normal size.

For the prevention of this disease the author recommends thorough spraying with Bordeaux mixture.

Notes on the black knot of plum, J. B. Dandeno (*Rpt. Mich. Acad. Sci., 9 (1907), pp. 74, 75, fig. 1*).—The author reports on successful attempts in obtaining the ascospores from the black knot of plums. Upon careful examination it was found that the perithecia are not produced for about 3 years after infection. After the perithecia are produced the asci are quickly disseminated, and the old knots remain on the twigs. In order to collect material showing the asci and ascospores the third year's growth of the plum knots must be secured.

From inoculation experiments with conidia formed by the fungus, it seems that they are not very active as infecting agents. Only a small proportion of infection with ascospores succeeded in producing the disease, which seemed to indicate that artificial inoculation is not readily accomplished.

Gooseberry black knot (*Jour. Bd. Agr. [London], 14 (1908), No. 11, pp. 680, 681, figs. 4*).—A description is given of a disease of gooseberries and red and black currants that is due to the fungus *Plowrightia ribesia*.

The fungus is a wound parasite, and it seems probable that aphids and scale insects enable it to gain entrance into the living tissues of the plant. The first indication of disease is the wilting and yellowing of the leaves, which fall quite early in the season. As a rule a branch is not killed outright in the first season of the attack, but during the second year the leaf buds remain in half-opened condition and the branch dies, owing to the presence of the fungus mycelium in the water conducting vessels. There is no external evidence of the fungus until the branches are dead or nearly so, when the fruiting bodies burst through the bark, forming elongated or grouped blackish warts.

It is believed that spraying will have little or no effect in controlling this disease, and it is recommended that on its first appearance all branches whose foliage is wilting should be removed and burned.

A combined treatment for the prevention of the powdery and downy mildew of grapes, D. Donon (*Jour. Agr. Prat., n. ser., 15 (1908), No. 5, pp. 146–148*).—A description is given of a fungicide that is said to consist of a copper and sulphur mixture to which formaldehyde is added. This fungicide is claimed to be very efficient in the control of various grape diseases, including the powdery mildew, and its use does away with the necessity of sulphuring the vines. The fungicide is prepared for the trade in a concentrated form, and is said to be of easy application and less expensive than a liquid spray for the prevention of black rot, etc., with a separate application of sulphur for the powdery mildew.

The efficiency of this new fungicide in controlling other plant diseases is to be tested.

Timber fungi, with special reference to the pines, C. G. Bates (*Ann. Rpt. Nebr. Hort. Soc., 38 (1907), pp. 201–208*).—Descriptions are given of fungi causing damping off of the seedlings of pines, pine blister due to *Coleosporium senecionis*, hypertrophy of pine cones, ring scale of pine due to *Tranetes pini*, root rots caused by *Polyporus annosus* and *Armillaria mellea*, and dry rots due to *P. vaporarius* and *Merulius lachrymans*.

The treatment of damping-off in coniferous seedlings, P. Spaulding (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 4, pp. 8*).—Greenhouse tests have been made by the writer for several years relative to the effect of various chemicals upon the damping-off diseases of tender coniferous seedlings. The work was extended to field conditions in 1907, experiments being conducted in several nurseries of the New York Forest, Fish, and Game Commission and of the Vermont State Forestry Commission, located, respectively, at Saranac Inn, N. Y., and Burlington, Vt. The results presented are not considered final, but are offered to nurserymen with the hope that they may prove useful until more conclusive proof of the comparative value of the chemicals tested can be secured.

The plats used were located in seed beds 12 ft. long and 4 ft. wide, each bed being divided into 3 equal parts 4 ft. square. The chemicals were used in the form of fine powders or in solutions. The solutions were applied to the soil with an ordinary sprinkling can before the seeds were sown and again about 5 days after the seedlings had come up. The powders were applied to the beds only after the seedlings had been up for 3 or 4 days, a simple form of duster having a perforated bottom being used. Very light coatings were given, which were renewed promptly after each rain.

Powdered sulphur was used in 3 forms, namely, washed, resublimed, and precipitated, with favorable results, although the first form gave slightly the best result. The preparation of dry Bordeaux mixture was found to be too tedious and time-consuming to be of use in the case of a disease like damping-off and was discarded for a copper sulphate and lime mixture which is easily and quickly made. Powdered sulphate of copper was mixed with fresh slaked lime 1 : 10. No injurious results were noted when this mixture was freely used, even when the seedlings were still wet with dew. Very good results were obtained in checking the damping-off, and it is believed that the mixture may prove of commercial value.

Solutions of potassium sulphid and of potassium permanganate gave no definite results, owing to the absence of the disease in the experimental plats. Commercial 40 per cent formalin, used at the rate of 4 oz. to 3 gal. of water, when applied to the soil before seeding and not afterwards, seemed to have no effect on the disease. When the application was repeated after the seedlings had come up the results were poor, hence it is believed that formalin is of little value with the damping-off diseases of coniferous seedlings unless supplemented after the germination of the seed with some other efficient chemical.

The best results were obtained with dilute sulphuric acid. The soil was thoroughly drenched with a solution of 1 oz. of sulphuric acid to 1 gal. of water several days before sowing the seed, and the treatment was repeated about a week after the seedlings came up. When noted in December, there was a very good stand of fine, healthy seedlings on the treated plat and the soil was entirely free from algæ and moss, while on the check plat there were practically no seedlings left and the soil was green with algæ and moss. Of the several species thus treated, the Norway spruce alone showed ill effects from the treatment. A weaker solution, 1 part sulphuric acid to 500 of water, is recommended in preference to the stronger one used in these experiments.

Fomes pinicola and its host plants, L. H. Pennington (*Rpt. Mich. Acad. Sci., 9 (1907), pp. 80–82*).—This fungus, which is said to be one of the most common of the larger fungi that infect conifers, is reported by the author as being found on a number of broad-leaved species of trees, among them the hard maple, beech, yellow and white birch, and balsam poplar.

Some diseases of rubber plants, C. Bernard (*Bul. Dépt. Agr. Indes Néerland., 1907, No. 12, pp. 79, pls. 2*).—The author gives descriptions of some of the principal fungus diseases and insect enemies of rubber plants, grouping them under the following species of plants: *Hevea brasiliensis*, *Ficus elastica*, *Castilloa elastica*, *Kickxia elastica*, and *Manihot glaziovii*.

Fungicides, H. H. Whetzel and C. S. Wilson (*New York Cornell Sta. Bul. 252, pp. 363–364, fig. 1*).—Popular directions are given for preparing and using the most important fungicides.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report on rabbit branch, A. Crawford (*Jour. Dept. Agr. West. Aust., 15 (1907), No. 12, pp. 935–938*).—The campaign against rabbits in Western Australia is being pushed vigorously. Complaint is made that many of the individual farmers are disposed to allow the government to bear the whole burden and do not even assist by the destruction of rabbits on their own farms. The methods employed include the use of rabbit-proof fences, encouragement of the natural enemies of rabbits including iguanas, hawks, etc., and killing all doe rabbits which are caught by various trapping devices (the buck rabbits being set free).

Observations on the food of a number of birds, N. Passerini and G. Cecconi (*Bol. Ist. Agr. Scandicci, 2. ser., 7 (1908), No. 1, pp. 12–102*).—The authors studied the kind of food eaten by a large number of wild birds and on the basis of the data obtained classified them in accordance with their food habits.

The locust-destroying birds of the Transvaal, F. W. D'Evelyn (*Condor, 10 (1908), No. 1, pp. 10–14*).—Descriptive notes are given on the habits of various birds which have been observed to feed upon locusts in the Transvaal. Special mention is made of storks, starlings, guinea fowls, and the secretary bird.

Some observations concerning the effects of freezing on insect larvæ, J. S. Hine (*Ohio Nat., 8 (1908), No. 4, pp. 258–260*).—The larvæ of *Bellura obliqua* were placed in water over night and exposed to a temperature of —15° F. This process was repeated for 6 nights, the temperatures ranging from —6 to —16° F. None of the larvæ was injured. The larvæ of the tomato hawk moth were killed by a frost severe enough to kill tomato vines. Similarly with larvæ of the fall cankerworm a frost on May 4 killed a large number of them.

The more important insects injurious to Indian agriculture, H. M. Lefroy (*Mem. Dept. Agr. India, Ent. Ser., 1 (1907), No. 2, pp. V + 113–252, figs. 82*).—A description is given in systematic order of the insects known to be injurious to crops in India. No list of economic insects has previously been published for this territory and it is believed that the bulletin will be of service to economic entomologists. In the case of each insect a brief description is given with notes on its distribution, biology, food plants, and the extent of its injuries.

The Indian surface caterpillars of the genus Agrotis, H. M. Lefroy and C. C. Ghosh (*Mem. Dept. Agr. India, Ent. Ser., 1 (1907), No. 3, pp. 253–274, pl. 1*).—Several species of Agrotis and Euxoa are described in detail and notes are given on their biology. Particular attention is given to a discussion of *Agrotis ypsilon*.

Combating ants and locusts in South America. C. Bolle (*Tropenpflanzer, 11 (1907), No. 6, pp. 392–401*).—A number of leaf-eating ants occur in South America and may cause serious damage. These insects may be controlled to some extent by the use of burrows combined with pits in which the ants are captured. In the control of locusts good results are reported from the introduction of colonies of predaceous ants which feed upon them. It is stated that these ants may easily be transported in whole colonies to cultivated fields or other localities where their help is needed in the control of locusts.

European insect pests in North America. R. Heymons (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 1, pp. 6–22*).—A historical statement is given of the introduction and distribution of gipsy moth and brown-tail moth in the United States with particular reference to the use of artificial remedies in controlling the pests and to the importation of their parasites.

[Insect pests]. J. Craig, M. V. Slingerland, and C. R. Crosby (*New York Cornell Sta. Bul. 252, pp. 335–349, figs. 12*).—Attention is called to the underlying principles and economic aspects of spraying in general. Directions are given for preparing insecticides and applying them in the control of the chief insect enemies of apples, plums, cherries, quinces, peaches, pears, nursery stock, grapes, small fruits, roses, potatoes, cucurbits, cabbages, onions, and greenhouse plants.

Report of the entomologist and plant pathologist. W. V. Tower (*Porto Rico Sta. Rpt. 1907, pp. 31–38, pl. 1*).—Notes are presented on the chief pests infesting oranges, tobacco, vegetables, sugar cane, pineapples, and other crops, the use of wind-breaks in checking purple scale, and the preparation of kerosene emulsion.

The "orange dog," a variegated caterpillar belonging to the genus Papilio, was found feeding on the orange during July, and a second brood was observed October 18, at which time the larvæ were half grown. The orange leaf-weevil occurred in great numbers in the latter part of May. Spraying with arsenate of lead was effective for both of these pests. For orange scab, spraying with Bordeaux mixture just as the fruit forms and again after from 10 to 14 days is recommended. Nurseries of rough lemon should not be planted between budded rows of trees, nor should nurseries be planted on the windward side of the groves. Red scale and purple scale are causing much trouble but may be combated by spraying with kerosene emulsion 1:6 and the use of wind-breaks.

The principal tobacco pests were cutworms, changas, flea beetles, hornworms, and nematodes. A Paris green mash made up of a mixture of 20 lbs. bran or corn meal with ½ lb. Paris green made into a thick paste with 1 gal. molasses and 1½ gal. water, and applied in the form of small cones partly below ground and partly above, is recommended for changas and cutworms. *Telenomus monilicornis* was observed as a parasite in the eggs of the hornworm. *Plutella maculipennis* did considerable damage to cabbage, kale, mustard and turnips. For mealy bugs on sugar cane and pineapples, dipping in kerosene emulsion is advocated. Tobacco dust placed in the crown of the pineapple has also given excellent results.

Brief notes are also given on May beetles, brown scale, rust mite, southern cabbage worm, a white fly, plant lice, striped cucumber beetle, the melanconium stage of *Tricosphæra sacchari*, sugar cane weevil, a borer of the genus Xyleborus, rice weevil, *Icerya montserratensis*, *Pulvinaria psidii*, rufous scale, wax scale, mummy disease of guavas, and other pests.

The so-called green bug and other grain aphids in Minnesota in 1907. F. L. Washburn (*Minnesota Sta. Bul. 108, pp. 257–280, pl. 1, figs. 15; Spec. Rpt. State Ent. Minn. 1908, Mar., pp. 21, pl. 1, figs. 15*).—On account of the alarm which prevailed among the grain growers of Minnesota regarding the possible invasion of the State by the green bug, an investigation was made of this insect

and of other related aphids. The green bug occurred sparingly in various parts of Minnesota during 1907 but did not affect the wheat crop appreciably. The author believes that the long cold winters and hot summers of Minnesota are unfavorable for the multiplication of this pest. The most common grain aphid in Minnesota is *Macrosiphum granaria*. This pest is attacked by parasites and is usually held in control by climatic conditions. An account is given of the injury caused by the green bug in the southwestern States and descriptions are presented of the developmental forms of this pest as studied in the insectary.

Peculiar injury to barley by Clorops tæniopus, B. Wahl (*Ztschr. Landw. Versuchsw. Österr., 10 (1907), No. 10, pp. 750–756*).—The author had occasion to observe an unusually severe attack of *Clorops tæniopus* upon barley. In the infested plants the inflorescence appeared to be normal in its early stages but soon showed a pronounced deformation due to the attacks of the insect.

Kafir corn aphis (*Agr. Jour. Cape Good Hope, 32 (1908), No. 1, pp. 27–31*).—*Aphis sorghi* has attracted attention on account of its ravages upon Kafir in South Africa since 1904. The pest is apparently spreading and its eradication is a difficult problem. A description is given of the insect together with a brief account of its natural enemies which thus far seem to include merely lady beetles. Apparently some advantage is to be derived from early sowing of Kafir. According to certain growers, Bushman Kafir is rather more resistant to aphis attacks than other varieties.

The asparagus beetles, F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Circ. 102, pp. 12, figs. 6*).—The life history of these insects has been previously studied by the author (E. S. R., 9, p. 569; 10, p. 570; 19, p. 158). In this circular attention is given to the habits, life history, and means of combating *Crioceris asparagi* and *C. 12-punctata*. The present status and distribution of these insects is outlined and recommendations are made regarding the most effective remedies for controlling the pests.

Screening for the protection of cabbage seed beds, W. J. Schoene (*New York State Sta. Bul. 301, pp. 165–174, pl. 1*).—In raising seedling cabbage, great losses have been experienced from attacks of flea beetles (*Phyllotreta vittata* and *Systena hudsonias*) and root maggots (*Pegomya brassicæ* and *P. fusiceps*). The ordinary methods adopted for the control of these pests have not given satisfactory results. Experiments were therefore undertaken to test the value of cheese cloth screenings for the protection of cabbage seed beds from these pests. A bed was sown to cabbage seed on May 15 and covered with cheese cloth on May 20 just as the plants were coming out. On June 20 the screen was removed to harden the plants before transplanting. The hardening process was allowed to continue for 13 days. The total expense for cheese cloth, lumber, laths, wire, and tacks for screening a seed bed 12 by 150 ft. was $20.21 or about 40 cts. per 1,000 cabbage plants.

The results indicate that cabbage plants may be completely protected from root maggots by screening with cheese cloth and that the flea beetles are also prevented from attacking the young plants. The losses in check beds which were not screened were very large.

Protecting cabbage plant beds from maggots, F. H. Hall (*New York State Sta. Bul. 301, popular ed., pp. 4, fig. 1*).—A popular edition of the above.

Report on the study of insects injurious to cranberries during the summer of 1907, C. B. Hardenburg and O. G. Malde (*Wisconsin Sta. Rpt. 1907, pp. 309–320, figs. 2*).—The three most injurious insect pests of the cranberry are the blackheaded vine worm, yellowheaded vine worm, and fruit worm. Biological notes are also given on tip worm, girdler, a species of snout beetle, and other less important cranberry insects.

In controlling the insect pests of cranberries, flooding is recommended for the first brood of the blackheaded or yellowheaded vine worm. Spraying is a safer but more laborious method of control. Two applications are sufficient for vine worms and three for fruit worms. The spray recommended for this purpose is lead arsenate solution and Bordeaux mixture with 5 lbs. of resin soap added for each 50 gal. Arsenate of lead is considered superior to Paris green.

Report on the work of the section for plant protection, 1906–7, C. BRICK (*Stat. Pflanzenschutz Hamburg, Bot. Staatinst., [Ber.] Abl. Pflanzenschutz, 9 (1906–7), pp. 1–18*).—A detailed report is given of the extent of importation of apples and other fruits and living plants from America and other countries.

As in previous years the Baldwin is the chief apple imported from the United States, constituting about 70 per cent of the total importation and coming chiefly from New York and Maine. From a total of about 200,000 packages of these apples about 11,000 or approximately 6 per cent were found to be infested with San José scale. Apples imported from New South Wales were found to be slightly infested with San José scale. Notes are also given on other insect pests and plant diseases found upon this fruit.

A report is also made upon the condition of live plants imported from various countries.

Does it pay to spray Nebraska apple orchards? R. A. EMERSON and F. E. DENNY (*Nebraska Sta. Bul. 106, pp. 3–20*).—Practical tests were made under what were considered average conditions to determine the value of spraying orchards, particularly for the control of codling moth and apple scab. Five applications were made from May 2 to August 20 of combined insecticides and fungicides chiefly Paris green or arsenate of lead and Bordeaux mixture. For the first three applications Paris green and Bordeaux mixture were used while arsenate of lead was used alone in the last 2 sprayings. In one orchard a net gain of $1.70 per tree was produced and in another orchard of $2.56, the increased yield being 1.17 bu. and 2.1 bu. per tree, respectively.

The apple maggot or railroad worm, A. L. QUAINTANCE (*U. S. Dept. Agr., Bur. Ent. Circ. 101, pp. 12, figs. 2*).—The apple maggot is placed among the five chief insect enemies of the apple. It is a native American species and its native food is apparently species of Crataegus. It attacks nearly all varieties of cultivated apples. The spread of the apple maggot when once established in the orchard is very slow. The insect is described in all its stages and notes are given on its life history. There is only one generation annually.

In combating this pest no hope can be entertained of success from the use of arsenicals. All fallen infested fruits should be promptly gathered and fed or otherwise destroyed. If preferred, orchards may be pastured with sheep, hogs, or cattle to destroy the windfall apples promptly. Some success may also be expected from the thorough cultivation of orchards.

The insect pests of peach trees, F. LAFONT (*Prog. Agr. et Vit., 24 (1907), No. 49, pp. 680–685*).—Biological and economic notes are given on *Ceratitis capitata*, codling moth, *Anarsia lineatella*, *Cossus ligniperda*, bark beetles, and other insects injurious to peaches.

State nursery inspection, J. G. MOORE (*Wisconsin Sta. Rpt. 1907, pp. 369–378, figs. 3*).—The law governing nursery inspection in Wisconsin was so amended in 1907 as to provide for the inspection of the premises of all nurseries doing business within the State. The general conditions observed in the nurseries during the past season were somewhat improved. San José scale was found in one nursery only. Mention is also made of the prevalence of oyster-shell bark-louse, woolly aphis, strawberry root louse, cottony maple scale, coxcomb gall of the elm, and anthracnose of raspberries.

Diseases and insect pests [of coffee], J. W. Van Leenhoff (*Porto Rico Sta. Rpt. 1907, p. 40*).—Experiments in fertilizing to overcome losses due to the leaf-miner seemed to give good results, the field described in a former report (E. S. R., 18, p. 1060) having completely recovered and showing very vigorous growth, with a very noticeable decrease of the brown spots on the leaves. A number of old coffee trees have been attacked by a borer which eats its way in a vertical direction through the heart of the trunks and branches. This pest is now under investigation.

Individual and seasonal variations in Helopeltis theivora, with description of a new species of Helopeltis, H. H. Mann (*Mem. Dept. Agr. India, Ent. Ser., 1 (1907), No. 4, pp. 275–337, pl. 1, figs. 5*).—A large number of specimens of *Helopeltis theivora* were obtained from various parts of India and careful observations were made to determine the variations which occur in this species. In this work variations in color were noted and also variations in the size and proportions of the antennæ, legs, rostrum, and other anatomical parts. Particular attention was given to the possible effect of locality, seasons, and food upon variations, but these factors appeared to be of little constant value. A change of food from tea to cinchona led to no modification either in the structure of the insect or in its color. The relationship between *H. theivora* and *H. antonii* is briefly discussed.

The coccidæ attacking the tea plant in India and Ceylon, E. E. Green and H. H. Mann (*Mem. Dept. Agr. India, Ent. Ser., 1 (1907), No. 5, pp. 337–355, pls. 4*).—The information relating to scale insects which attack the tea plant in India and Ceylon has been brought together and summarized in this bulletin. A list including 31 species, three of which are described as new, is given, together with brief notes on the relative importance of these species.

Means of combating cockchafers, Von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 1, pp. 73–75, fig. 1*).—A considerable variety of insecticides was used in spraying foliage to test their effectiveness in the control of cockchafers. Bordeaux mixture, barium chlorid, tobacco decoction, and insect powder had no effect. The use of Paris green, however, was attended with striking success. Attention was called to the apparent wide-spread distribution of a parasitic fungus, *Isaria densa*, upon cockchafers.

On a new phytophagous mite with notes on other species of economic importance, C. G. Hewitt (*Mem. and Proc. Manchester Lit. and Phil. Soc., 52 (1907–8), pt. 1, No. 5, pp. 1–10, pl. 1, figs. 2*).—*Lohmannia insignis dissimilis* is described as a new species of mite attacking tulip bulbs. *Rhizoglyphus echinopus* is also mentioned as an important enemy of the bulbs of tulips, hyacinths, and other liliaceous plants. *Glycyphagus spinipes* has appeared in a number of instances as a serious house pest occurring in large numbers and attacking the horsehair or other material used in upholstered furniture.

Experiments in the control of Tinea pellionella, L. Roussin (*Rev. Serv. Intend. Mil. [Paris], 20 (1907), No. 155, pp. 373–396*).—The appearance of this insect in its different stages is described in detail. A number of insecticides were tested in determining their effectiveness in controlling the pest. From a series of observations and experiments reported by the author it appears that benzine, turpentine, naphthalin, camphor, carbolic acid, and a number of other volatile substances of this class may produce asphyxia of the insect in woolen fabrics. The remedies mentioned give satisfactory results as used against all stages of the insect. Metallic salts such as arsenious acid, corrosive sublimate, and sulphate of copper are only slightly effective, while bitter substances such as aloes and extract of gentian have no effect whatever. The best results are to be obtained from the use of ordinary illuminating gas or bisulphid of carbon. Either of these substances is perfectly effective.

Bee breeding, S. N. Green (*Medina, Ohio, 1907, pp. 12*).—Complaint is made that the subject of bee breeding has not received sufficient attention. It is urged that in the improvement of the honey bee an ideal standard should be set up for which a score of points is suggested. After the ideal has been adopted, the problem consists, in the author's opinion, in improving the environment of bees in all possible ways and selecting those queens and drones which come nearest to the ideal standard.

Queen rearing, E. W. Alexander (*Gleanings Bee Cult., 36 (1908), No. 4, pp. 209, 210*).—The question is often raised whether it is better for the bee raiser to rear his own queens or depend upon professional queen breeders. The author concludes that in most cases the professional breeders will obtain better results than the ordinary bee raiser and that if certain queens in an apiary should develop particularly desirable qualities they may be sent to a breeder for the purpose of producing other queens of similar characteristics.

The digestibility of mulberry leaves with relation to the rational feeding of silkworms, P. Bucci (*Staz. Sper. Agr. Ital., 40 (1907), No. 8–12, pp. 721–798*).—A long series of feeding experiments was carried out with the purpose of determining the digestibility of the leaves of different varieties of mulberries and other matters connected with the feeding of silkworms. Statistical data are presented in a tabular form showing the amount of mulberry leaves eaten under different conditions, the growth and weight of the silkworms, the amount of silk produced and its elasticity and other qualities.

A variety of mulberry obtained from Verona gave the best results both in respect to its digestibility and to the quantity and quality of the silk obtained as a result of feeding. Another variety of mulberry referred to as rosea proved no less digestible but the mortality of silkworms fed upon it was somewhat greater than in the case of the Veronese variety. The leaves of Chinese mulberries were much less digestible than those of the Veronese variety.

Experiments were also conducted in the addition of starch to the diet of mulberry leaves. It was found that this material could easily be sprinkled upon the leaves with a small expense of time and energy. Silkworms fed in this manner did not weigh more at maturity but the cocoons were heavier, the quantity of the silk was slightly greater, its quality was improved, and the mortality of the silkworms was diminished.

The author contends that careful experiments in the feeding of silkworms are as much needed as in the case of higher animals. These insects grow with great rapidity and produce a large amount of silk within a short time. The experiments thus far conducted indicate that the amount and quality of the silk are largely dependent upon a rational system of feeding.

FOODS—HUMAN NUTRITION.

Food chemistry, J. Varges (*Nahrungsmittelchemie. Leipsic, 1907, pp. 298, pls. 3, figs. 178*).—In this handbook of food chemistry the subjects treated have been arranged in alphabetical order. In the discussions of the various animal and vegetable foods, beverages, condiments, and commercial products, special attention has been paid to histological characteristics and microscopical methods, as well as to the more common methods of food examination.

The food chemist as an expert, C. A. Neufeld (*Der Nahrungsmittelchemiker als Sachverständiger. Berlin, 1907, pp. XX+477*).—This volume is designed for the information of public analysts and discusses general questions which have to do with food inspection, with special chapters on milk and other dairy products, fats and oils, fruits, honey, sugar, spices, beverages, etc.

The peacock edible, Martha McC. Williams (*Country Life Amer., 13 (1907), No. 2, pp. 252, 254, 256, fig. 1*).—Directions are given for preparing and cooking pea fowl. Though not commonly eaten, these birds are considered of superior quality and when range bred are very much like game.

Analyses of canned sausage, Balland (*Rev. Serv. Intend. Mil. [Paris], 20 (1907), No. 151, pp. 77, 78*).—Proximate analyses are reported of 4 samples which had been canned several years before.

Analyses of canned fish, Maljean (*Rev. Serv. Intend. Mil. [Paris], 20 (1907), No. 154, pp. 351–357*).—Examination was made of salt water fish when canned and when put up for soups. The canned fish was made up of 164 parts of flesh to 100 of jelly. The proportion of jelly to flesh, as the author points out, is much higher than in the case of canned beef and hence the nutritive value is lower. The fish canned for soup making was rich in fat, but the author believes that it is not suitable for army rations owing to the complicated process required in preparing it for the table.

A new method of preserving meat, H. de Lapparent (*Bul. Soc. Nat. Agr. France, 67 (1907), pp. 280–286; abs. in Hyg. Viande et Lait, 1 (1907), No. 11, pp. 511, 512*).—In the method of preserving described, meat is exposed to sulphur vapor for 24 hours and then stored in an atmosphere of carbon dioxid. Analyses showed that meat so preserved did not contain free sulphuric acid and that the cooked meat showed 22 gm. of sulphites and bisulphites per 100 kg.

Slaughtering and meat packing (*Bur. of the Census [U. S.] Bul. 83, pp. 7–41*).—According to the statistical data summarized and discussed the value of the combined slaughtering and meat packing industry in the United States in 1905 was $913,914,624, an increase of 16.6 per cent over 1900.

Meat inspection, M. Toubeau (*Bul. Mens. Off. Renseig. Agr. [Paris], 6 (1907), No. 11, pp. 1340–1359*).—A summary of French legislation on this subject.

Pasteur's theory applied to diastatic action in bread making, or rational bread making, Serand (*Rev. Serv. Intend. Mil. [Paris], 20 (1907), Nos. 157, pp. 549–590; 159, pp. 777–834*).—Part 1 of this article discusses the processes of bread making. Parts 2 and 3 treat of the biology of the various fermentations with detailed directions for making bread sufficient for 300 rations and explanations of the rationale of each step.

Survival of pathogenic bacteria in bread after baking, J. Roussel (*Rev. Serv. Intend. Mil. [Paris], 20 (1907), No. 152, pp. 122–131; abs. in Rev. Hyg. et Pol. Sanit., 29 (1907), No. 8, pp. 722, 723*).—According to the author's observations the temperature in the crumb of bread during baking ranged from 101 to 103° C. and in the crust from 125 to 140°. The author also studied the effect of such temperatures on tuberculosis bacilli artificially introduced into the dough with special reference to the question of the employment of tubercular subjects in bakeries.

Experimental studies of the character of flour, bread, and Italian pastes sold in Venice, A. Zoso (*Separate from Lab. Chim. Munic. Venezio, 1907; abs. in Chem. Zentbl., 1907, II, No. 21, pp. 1754, 1755*).—A large number of analyses are reported in this study of Venetian flour and flour products, undertaken with a view to studying the relation between composition and quality. Phosphoric acid and other ash constituents are reported in addition to the usual analytical data.

Cultivation of cassava and the manufacture of cassava flour in São Paulo, J. B. Sobrinho (*Rev. Agr. [São Paulo], 13 (1907), No. 147, pp. 479–483*).—Statistical and other data regarding the production of cassava flour are presented, together with an analysis of this material.

Flour and grist mill products, E. K. Ellsworth (*Bur. of the Census [U. S.], Bul. 64, pp. 45–84*).—From an extended summary of data it appears that the total value of the flour and grist mill products produced in the United States in 1905 was $713,033,395, an increase of 42.2 per cent over 1900.

Starch, R. H. Merriam (*Bur. of the Census [U. S.] Bul. 64, pp. 85–92*).—The statistical data reported in this article show that the total value of the starch products produced in the United States in 1905 was $8,082,904, an increase of 12.5 per cent over 1900.

Bacteriological studies of field-grown vegetables from Moscow, M. B. Kozyn (*Vrach [St. Petersb.], 6 (1907), p. 22; abs. in Chem. Ztg., 31 (1907), No. 86, Repert. No. 78, p. 522*).—Examination of a number of samples of vegetables showed that 3 had tetanus bacilli on the surface. Sixty samples showed no typhoid bacteria though the surface was more or less infected with intestinal bacteria. Generally speaking, bacteria were not found in the interior of the vegetables through pus bacteria were finally found in 5 samples.

The soy bean as a feeding stuff in Italy, G. Ruata and G. Testoni (*Bol. Uffic. Min. Agr., Indus. e. Com. [Rome], 6 (1907), VI, No. 6, pp. 698–718, pls. 5*).—In a discussion of the probable value of soy beans as a feeding stuff under Italian conditions data are summarized regarding the culture of this crop and the chemical composition and nutritive value of the beans, and 9 analyses are reported of Italian-grown samples. Determinations of the pentosan content of 5 samples which are quoted showed that it ranged from 2.86 to 3.86 per cent.

Descriptions and analyses of bean curd and other soy-bean products used as food for man are quoted and the possible use of soy beans as a bread stuff and as porridge is discussed. A bibliography is appended.

The nutritive value of the avocado, C. A. Garcia (*Bul. Assoc. Chim. Sucr. et Distill., 25 (1907), No. 5, pp. 516, 517*).—The author analyzed Peruvian-grown avocado and found the following values: Water 38.00 per cent, protein 3.79 per cent, fat 34.10 per cent, cellulose and undetermined material 28.10, and ash 3.50 per cent. The phosphoric acid content of the pulp was 0.817 per cent or 12.9 per cent of the total ash. Neither starch nor sugar were found.

The large proportion of fat, protein, and phosphoric acid, the author concludes, indicates that avocadoes have a high feeding value. On the basis of personal experience he believes that they may be valuable in invalid dietetics, particularly in the case of tuberculous and diabetic patients.

Some observations on the date, A. E. Vinson (*Plant World, 10 (1907), No. 11, pp. 259–262*).—On the basis of his observations, the author briefly discusses the composition of dates with special reference to stages of ripening and related topics.

"The development of the fruit takes place in 3 stages. After fertilization very little change in the fruit itself can be observed for several weeks, but during this period the entire energy seems to be expended in building a long massive stem. When this is nearly completed, the fruit starts to grow and the seed to mature. When the fruit has reached its full size, but is still green, it corresponds very closely in chemical character to any other nonstarchy fruit, and contains about 20 per cent of dry matter. The third stage now begins and additional sugar is heaped into the fruit at a rapid rate without any apparent change in size until upwards of 60 per cent dry matter is present. It then softens, the tannin becomes insoluble with consequent loss of astringency, and the fruit is ripe."

Concerning the quantity of fatty substance in some samples of olive flesh, N. Passerini (*Staz. Sper. Agr. Ital., 40 (1907), No. 6–7, pp. 606–617; Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 4 (1907), No. 3, pp. 322–333*).—Fifty samples were analyzed and the results discussed.

Some Algerian olive oils, II, L. Archibutt (*Jour. Soc. Chem. Indus., 26 (1907), No. 22, pp. 1185, 1186*).—The author reports the examination of 12 samples of Algerian olive oils from different localities in continuation of earlier work (E. S. R., 19, p. 765). It was found that varieties from certain districts showed extremely high iodin values, while oils from other varieties and districts gave normal or nearly normal results.

Investigations on the composition of cocoanut milk and the diastases of the fruit of Cocos nucifera, E. de Kruyff (*Agr. Prat. Pays Chauds, 7 (1907), No. 55, pp. 339–345*).—The conclusion is drawn from the experimental data reported that cocoanut milk contains saccharose, sugar being inverted during the ripening of the nut by means of the diastase sucrase, which is dissolved in the juice present. The diastase is secreted by the albumin cells. In addition to sucrase cocoanut milk contains oxydase and catalase, the 2 last mentioned being absent in the young nuts. The haustorium of the nut contains lipase, a proteolytic diastase, amylase, catalase, and a peroxydase.

Adulteration of cola nut and preserved truffles (*Ann. Soc. Agr. Sci. et Indus. Lyon, 1906, pp. 133, 134*).—Analytical data are reported.

Edible oil from safflower seed, H. E. Houghton and P. R. Mudaliar (*Cent. Agr. Com. Madras Circ. 23, pp. 2*).—A brief note on the use of safflower seed (*Carthamus tinctorius*) and safflower seed oil for culinary purposes and on the experimental manufacture of the oil. The oil cake is used as cattle feed.

Alcohol-free beverages, O. Mezger (*Ztschr. Angew. Chem., 20 (1907), No. 49, pp. 2116–2121*).—The results of the examination of 44 samples are reported and discussed.

Analyses of white wines at the National School of Agriculture, M. Kirschbaum (*Bol. Min. Fomento [Peru], 5 (1907), No. 8, pp. 80–85*).—Detailed analyses are reported of 5 samples.

Statistics of Swiss wines for the year 1906 (*Ann. Agr. Suisse, 8 (1907), No. 5, pp. 247–272*).—Several hundred analyses of Swiss wines from various cantons are reported.

Port wine and the vineyards of the Alto Douro (*Lancet [London], 1907, II, No. 24, pp. 1705–1714*).—A descriptive article with analyses of musts, ports, imitation ports, and brandies used for checking fermentation.

Institutions for the technical examination of foods, condiments, and commercial products in the German Empire, J. König and A. Juckenack (*Die Anstalten zur technischen Untersuchung von Nahrungs- und Genussmitteln sowie Gebrauchsgegenständen. . . im Deutschen Reiche, etc. Berlin, 1907, pp. XV+308*).—Legal and other data regarding the character and extent of the German department of public health and the institutions in different provinces for inspection and analysis.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 93–95, pp. 4; 96, pp. 2*).—The questions considered are an amendment to regulation 34, the labeling of medicinal and table waters, the use of neutral spirits distilled from beet sugar molasses in the preparation of whisky compounds and imitation whiskies, and serial number guaranty.

Food and drug inspection, A. E. Leach (*Ann. Rpt. Bd. Health Mass., 38 (1906), pp. 351–409*).—A total of 7,530 samples of food and drugs was examined under the provisions of the State law, of which 5,520 were of good quality, while the remainder did not correspond to the requirements of the statutes. The report contains details of the work.

Housekeeping in Egypt, Emily Williams (*Boston Cooking-School Mag., 12 (1908), No. 7, pp. 317, 336, 337*).—Food and diet of the Egyptian wage-earners and families living in the country are described, as well as methods of preparing bread, meat, rice, and other foods, and related topics.

How a five-cent lunch is cooked and served at the Honolulu Normal School, Marion Bell (*Boston Cooking-School Mag., 12 (1908), No. 6, pp. 292, 293*).—Pupils receive part of their training in preparing and serving a school lunch. The receipts are used for defraying the expenses of the course in cookery and have been adequate for the purpose. The plan, it is stated, has proved very successful.

School lunches (*Ann. Rpt. Women's Ed. and Indus. Union, 29 (1908), pp. 34, 35*).—Hot lunches were supplied to 12 schools. The work is briefly described.

Vegetable products [of northern Nigeria] (*Bul. Imp. Inst., 5 (1907), No. 3, pp. 327–332*).—In an account of northern Nigerian vegetable products in the Indian and Colonial Collections of the Imperial Institute, considerable information is given regarding guinea corn, Indian corn, rice, acha seed (*Digitaria* sp.), and other cereals, and roots, vegetables, vegetable fats, etc., used locally for food, ways in which they are prepared for the table, etc.

Diet in Indo-China, M. Kermorgant (*Ann. Hyg. Pub. et Méd. Lég., 4. ser., 7 (1907), pp. 411–431*).—The author discusses the diet of native and foreign residents of Indo-China, and describes available food supplies, important hygienic measures, and related topics. He states that the natives, as is the case with other races in the far East, live very largely upon rice, pork, fish, and vegetables, rice being eaten in very large quantities. In his opinion, Europeans living in the Tropics should exercise moderation in diet and should avoid an excess of energy-yielding foods, though the energy value of the diet must be proportional to the amount of physical work performed. The article also furnishes considerable data regarding the food plants cultivated and the animals raised in Indo-China.

Diet of the poor and its social significance, M. Rubner (*Rev. Hyg. et Pol. Sanit., 29 (1907), No. 9–10, pp. 854, 855*).—In a paper presented at the Fourteenth International Congress of Hygiene and Demography, the author discusses the results which, in his opinion, follow the long continued use of a diet of low nutritive value and composed largely or exclusively of vegetable foods, such as is commonly noted with the poor in Europe. In his opinion such a diet is responsible for defective physical condition, a lowered ability for work, an increase of morbidity and mortality, a lowered resistance to epidemic diseases, and similar undesirable results.

Hygiene in relation to nutrition and physiology, Reiss (*Hyg. Zentbl., 3 (1907), No. 13–14, pp. 409–414*).—A report of the meeting of the section of hygiene in relation to nutrition and physiology at the Fourteenth International Congress of Hygiene and Demography. Brief abstracts are given of papers presented at the section meeting, including sulphurous acid in foods, by Kerp; the sociological effects of undernutrition, by Rubner (see above), and a paper on the same subject by Blauberg; a paper on minimum protein requirements, by Rubner; a paper on a similar subject by Forster; and a number of others on a variety of topics.

In his discussion of protein requirements Forster expresses the opinion that mineral matter in organic combination as existing in the protein molecule is of great importance. This is shown by the fact that protein from which mineral matter has been removed by dilute hydrochloric acid will not sustain life in animals even if the material thus removed is evaporated, incinerated, and added to the ration.

Influence of food on the progress of experimental tuberculosis, Lannelongue, Achard, and Gaillard (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 20, pp. 785, 786*).—It was found that the progress of experimental tuberculosis in guinea pigs was very much delayed when wheat gluten was added to a

basal ration in comparison with isothermic quantities of butter and sugar. The animals receiving the gluten ration lived 371 days and those fed sugar and butter 87 days and 40 days, respectively.

The authors believe that this experiment demonstrates the importance of nitrogenous material in the diet of tuberculous patients.

Recent dietetic experiments, J. H. KELLOGG (*Lake Placid Conf. Home Econ. Proc., 9 (1907), pp. 118–124*).—Some recent investigations on diet and physiological chemistry are discussed, particularly such phases of the work as in the author's opinion justify the use of a vegetarian diet and low proteid rations.

Physiological economy in nutrition. Is not a different explanation possible? A. HAIG (*Edinb. Med. Jour., n. ser., 22 (1907), No. 6, pp. 501–505*).—The position is taken that uric acid is the harmful substance formed by nitrogen metabolism in the body. Any observed increase in strength and endurance when the amount of proteid food is lowered is therefore due, the author believes, not to this factor but to the diminished uric acid which it involves, since, in his opinion, the lower the uric acid the less the internal friction and hence the greater the amount of energy available for external work. A constant relation, it is claimed, obtains between nitrogen consumed and force produced, so that although a diminished intake of protein may appear beneficial for a time by diminishing the uric acid, a continued lowering of the nitrogen intake leads eventually to breakdown.

On the relation between the output of uric acid and the rate of heat production in the body, E. P. CATHCART and J. B. LEATHES (*Proc. Roy. Soc. [London], Ser. B, 79 (1907), No. B535, pp. 541–545*).—Experiments with a man on uniform diet showed that exposure to cold with and without labor increased the uric acid output materially. If the body was warmly protected exposure to the cold with exercise did not produce such an increase. The results are discussed, but the author considers the available data too limited to furnish an adequate explanation of the observed facts. The total nitrogen and other constituents of the urine were determined also.

Investigations on purin bodies, 1882–1906, E. FISCHER (*Untersuchungen in der Puringruppe (1882–1906). Berlin, 1907, pp. 608; rev. in Brit. Med. Jour., 1907, No. 2448, p. 1592*).—This volume, in which the author has reprinted 47 papers relating to work carried on in his laboratory, constitutes a valuable reference work for those interested in questions of purin and metabolism.

Has a purin-free dietary any special therapeutic value? C. WATSON (*Brit. Med. Jour., 1907, No. 2451, pp. 1759–1761*).—From practical experience the author concludes that there is no special therapeutic effect in a purin-free diet. The benefit derived from such a régime in certain cases, he believes, would be equally obtained by the use of a carefully planned system of feeding, formed without special reference to purin condition. "In some cases the restriction in amount of animal protein food is of special value, in others the diminution in the carbohydrate, and especially the sugars, is equally efficacious, and in others the restriction of various alcoholic liquors will suffice."

The behavior of nonfermentable carbohydrates in the animal body, W. BRASCH (*Ztschr. Biol., 50 (1907), No. 2, pp. 113–162*).—The author studied the question of the assimilation of galactose, pentoses, and other carbohydrates with special reference to the behavior of nonfermenting carbohydrates in diabetes. In harmony with the results of other observers he found that comparatively small quantities of galactose were assimilated by normal man, the upper limit in his experiments being 30 to 40 gm. per day. As shown by experiments with dogs, pentoses can not be regarded as precursors of glycogen. The author

considers it certain that the consumption of pentoses increased nitrogen metabolism.

Concerning the digestion and utilization of crude fiber and cellulose by man and animals, H. Lohrisch (*Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 2 (1907), No. 21, pp. 801–822*).—A critical summary and discussion of the literature of crude fiber and cellulose assimilation, together with the results of the author's own investigations.

In experiments in which a man was fed cellulose specially prepared from cabbage it appeared that it was very largely absorbed in soluble form. Sugar was not formed from it nor did it undergo fermentation. In general, the author believes that the amount of cellulose which a man secures in an ordinary mixed diet is so small and its cleavage value so low that cellulose has practically no value as a feeding stuff for normal man.

The article includes an extended bibliography.

The effect of cocoa on metabolism, Gerlach (*Österr. Chem. Ztg., 10 (1907), No. 22, pp. 310, 311*).—In a paper presented before the meeting of the German Naturalists and Physicians, September, 1907, the author briefly summarizes the results of experiments showing that the use of cocoa, with either large or small amounts of fat, as a part of the diet did not diminish thoroughness of digestion in general.

The mineral matter required by the human body, H. C. Sherman (*Lake Placid Conf. Home Econ. Proc., 9 (1907), pp. 114–118*).—The results of the author's investigations with iron (E. S. R., 19, p. 58) and similar studies with calcium and phosphorus not yet reported in detail are summarized and discussed with special reference to the kinds and amounts of mineral matter required by the body.

From a comparison of the computed amounts of ash constituents supplied by 20 American dietaries with the results of available metabolism experiments it appears that "the amount of iron runs approximately parallel to the amount of protein and there is usually neither greater nor less likelihood of deficiency of the one than of the other. In the case of lime, however, the variations between the different dietaries were much greater, and in nearly half of the cases the diet appeared to furnish less lime than was required for the maintenance of equilibrium in many of the metabolism experiments. In the case of phosphorus, nearly one-third of the dietaries appeared to be deficient when judged by the same standard. From this it would appear that in the selection of food and the planning of dietaries, at least as much attention should be paid to the amounts of calcium, phosphorus, and iron as to the amount of protein. In many cases the dietary may readily be improved with respect to the ash constituents by a substitution of milk or cheese for a part of the meat and a freer use of fruits and vegetables in place of a part of the sugar and starch."

Estimation of water vapor by means of the Jaquet respiration apparatus, R. Staehelin (*Verhandl. Naturf. Gesell. Basel, 19 (1907), No. 1, pp. 100–108*).—The data reported show that the Jaquet respiration apparatus (E. S. R., 16, p. 287) gives accurate results in experiments with men and animals.

Report of progress in food and nutrition, 1906–7, C. F. Langworthy (*Lake Placid Conf. Home Econ. Proc., 9 (1907), pp. 104–112*).—A brief survey of the nutrition investigations carried on during the year 1906–7, particularly those conducted under the auspices of the Office of Experiment Stations.

ANIMAL PRODUCTION.

Fodders and grasses, J. C. Brunnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1906–7, pp. 68–70*).—Detailed analyses of sheep's burnett (*Poterium sanguisorba*), rib grass (*Plantago lanceolata*), grasses of different sorts, maize silage, sorghum silage, and mazzagua are reported, together with proximate analyses of the same materials for comparison.

Salvia loca as a forage plant, P. Lavenir (*Bol. Min. Agr. [Buenos Ayres], 8 (1907), No. 3–4, pp. 215–218*).—This plant is said to be a very important forage crop in the Argentine Republic. Proximate and ash analyses of the flowers, leaves, and stems are reported. The leaves are the portion commonly eaten by cattle. In the author's opinion, the plant is comparable with alfalfa for grazing purposes.

The composition and digestibility of dried beet leaves, F. Honcamp, T. Katayama, and O. Kellner (*Deut. Landw. Presse, 34 (1907), No. 101, p. 787*).—On the basis of a large amount of experimental data, which is briefly summarized and discussed, the authors conclude that dried beet tops contain 3.8 per cent total protein, 1.8 per cent digestible protein, and have a starch value of 27 per cent. If the material could be freed from sand before drying, they calculate that the nutritive value would be 20 per cent higher.

Drying beet tops and the use of such material as a feeding stuff, F. Honcamp and T. Katayama (*Landw. Vers. Stat., 67 (1907), No. 5–6, pp. 433–463*).—Data are summarized regarding methods of drying beet tops and the composition and digestibility of the dried material.

Olive pomace as a feeding stuff for farm animals, G. Briganti (*Coltivatore, 53 (1907), No. 47, pp. 653–656*).—Analytical and other data are quoted in a discussion of the value of olive pomace for farm animals.

Maizena feed and homco, F. Barnstein (*Landw. Vers. Stat., 67 (1907), No. 5–6, pp. 419–431, figs. 5*).—A summary of data regarding the manufacture, histological character, composition, and feeding value of these maize by-products.

Concentrated feeding stuffs, C. S. Cathcart, V. J. Carberry, and J. Gaub (*New Jersey Stas. Bul. 212, pp. 3–57*).—Under the provisions of the State law analyses have been made of cotton-seed meal, cotton-seed feed, linseed meal, linseed feed, gluten feeds, corn bran, cerealine and maizeline, hominy meal and feed, distillers' grains, malt sprouts, dried brewers' grains, molasses grains, feed mixtures, alfalfa meal, barley feed, dried beet pulp, cereal breakfast food by-products, ground flax flakes, ground flax seed, ground rice feed, condimental and commercial feeds, millet feed, commercial poultry feeds, meat meals and beef scraps, wheat bran, feeding flours, wheat middlings, wheat feed, rye bran, rye feed, rye middlings, corn meal, corn-and-cob meal, ground oats, corn and oats, a commercial oat feed, mixed grains ground together, buckwheat middlings, buckwheat bran, and buckwheat feed.

Of the 393 samples received at the station which should have been guarantied 5 failed to meet the requirement. In the case of 326 guarantied samples 50 deficiencies in protein and 56 in fat were noted. The authors report no direct adulteration but some of the unguarantied feeds were of inferior quality.

"The cheapest protein feeds this year were of high grade distillers' grains, cotton-seed meal, buckwheat middlings and bran, and dried brewers' grains. . . .

"When purchasing molasses feeds a careful examination should be made for the presence of weed seeds."

Condimental stock foods, F. W. Woll (*Wisconsin Sta. Rpt. 1907, pp. 96–110*).—A summary of Bulletin 151 of the station previously noted (E. S. R., 19, p. 464).

The animal body as a prime motor: Experiments with draft oxen, M. RINGELMANN (*Ann. Inst. Nat. Agron., 2. ser., 6 (1907), No. 2, pp. 243–279, figs. 9*).—The author has reported and discussed his experiments with Limousine and d'Aubrac oxen as draft animals. See also a previous note (E. S. R., 17, p. 1003).

Physiology of the blind intestine of Herbivora, W. USTJANZEW (*Biochem. Ztschr., 4 (1907), No. 2–3, pp. 154–171*).—Experiments which were made with rabbits showed that the blind intestine should be regarded as a specific organ for the digestion and resorption of crude fiber and pentosans. At least this organ exercises a distinct and favorable effect on the digestion of materials containing cellulose.

The value of so-called plant amids in nitrogen metabolism in the animal body, V. HENRIQUES and C. HANSEN (*Ztschr. Physiol. Chem., 54 (1907), No. 2–3, pp. 169–187*).—In the experiments with small animals (rats), which the authors report, asparagin, either alone or in combination with nitrogen-free material, did not prevent a constant loss of nitrogen. Amid substances obtained from 8-day-old etiolated sprouts of vetch, maize, and beans could not replace food protein, but exercised, though in small degree, a sparing effect on the daily proteid requirement. "Amids" obtained from potatoes seemed to possess no value as protein sparers nor could beet amids fed with gelatin peptone satisfy the body needs for protein. The authors call attention to the fact that their results were obtained with an omnivorous animal and that different results might be expected with Herbivora.

The substitution of amids for protein, K. FRIEDLAENDER (*Landw. Vers. Stat., 67 (1907), No. 3–4, pp. 283–312*).—The experiments reported were made with sheep. When amid nitrogen in the form of beet molasses was added to a ration low in protein the loss of body nitrogen was not lessened, although the greater part of the amids contained in molasses are convertible into proteid compounds by the action of bacteria. When asparagin was added to a diet containing low protein it exercised a slight protein-protecting power but was not at all comparable in this respect with a true protein, namely, aleuronat.

Protein metabolism in dogs. I, Protein metabolism on a low nitrogen diet, E. ÖSTERBERG and C. G. L. WOLF (*Biochem. Ztschr., 5 (1907), No. 2–4, pp. 304–343*).—With the exception of urea an increase was noted in all nitrogenous constituents of the urine as compared with total nitrogen on a nitrogen-free diet supplying an abundance of energy. In the case of urea there was a relative decrease in the amount excreted. Doubling the energy value of the diet did not change greatly the proportion of the nitrogenous constituents excreted in the urine. When casein was added to the diet the proportion was materially changed. The absolute quantity of creatinin excreted remained as before, and the absolute quantity of ammonia increased, while a decrease was noted in the proportional amount as compared with total nitrogen. Sulphur excretion was also studied, nitrogen and sulphur metabolism being found to be parallel.

Concerning the nature of the urine of young calves, L. LANGSTEIN and C. NEUBERG (*Biochem. Ztschr., 4 (1907), No. 2–3, pp. 292–298*).—When the urine of calves a few days old was analyzed levulose, milk sugar, and allantoin were identified. The results are discussed with special reference to the origin of the levulose.

A note on the quantities of marsh gas, hydrogen, and carbon dioxid produced in the alimentary canal of goats, A. E. BOYCOTT and G. C. C. DAMANT (*Jour. Physiol., 36 (1907), No. 4–5, pp. 283–287*).—The goats used in the experiments reported were confined in air-tight steel pressure chambers without ventilation and samples of the air were withdrawn at intervals for analysis. It

was found that goats produced from 10 to 30 cc. of hydrogen and methan per hour, which is equivalent to from 3.5 to 6.6 per cent by volume of the total carbon dioxid produced in the same time. "On an average the combustible gases equal 5 per cent of the total CO_2, and an average goat of 20 kg. produces about 9 liters a day. The proportion between H and CH_4 is variable; on an average the CH_4 forms two-thirds of the total combustible gas."

A study of the ratio of carbon dioxid to hydrogen and methan led to the conclusion that it is not unreasonable to assume that at least twice as much carbon dioxid as combustible gas arises from fermentation in the alimentary tract. "Since the combustible gas equals 5 per cent of the total CO_2, it follows that on an average at least 10 per cent of the total observed CO_2 arises from fermentation and not from tissue metabolism. There is little doubt that the bacterial action concerned in these processes goes on anærobically. . . .

"The mean respiratory quotient falls from 0.95 to 0.85 (at most), a figure which is not in accordance with the view that cellulose is dealt with by the tissues as a carbohydrate rather than as a fatty acid arising from the carbohydrate by bacterial action before assimilation.

"It would seem appropriate that the respiratory activity of different animals should, for comparative purposes, be expressed in terms of their 'clean' weight, i. e., the total weight less the contents of the alimentary canal. A number of observations have shown that the contents of the stomach and intestines constitute on an average 18.8 per cent of the total body weight in goats, the extreme figures being 16.4 per cent and 22.7 per cent."

Making corrections for the contents of the intestinal tract, the authors calculate, on the basis of 27 determinations, that the average carbon dioxid production of normal goats is 453 cc. or 0.896 gm. per kilogram body weight per hour.

Yearbook of scientific and practical animal breeding, R. Müller (*Jahrb. Wiss. u Prakt. Tierzucht, 2 (1907), pp. LIV+304, pls. 5, map 1*).—The larger part of this report is occupied with critical reviews of literature relating to the anatomy, physiology, hygiene, feeding, geographical distribution, utilization, and breeding of domestic animals of all kinds. The first part of the report contains special articles on the origin of species in domestic animals, the mutation theory as applied to animals, the development of horns, breeding of horses, hybrids between goats and sheep, and the fertility of mules. In a short article on the last-named subject (pp. LI–LIV), H. W. von Wahl presents evidence of the existence of fertile mules on an estate in Brazil. It is stated that one mare mule has borne colts both from jacks and stallions and that the offspring closely resembled the mother.

Live stock schemes, 1908 (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1907), No. 1, pp. 71–87*).—Regulations for registration of stallions and other matters concerned with the improvement of breeds of horses, cattle, and swine are recorded.

The central zootechnic station at São Paulo, H. Raquet (*Ann. Gembloux, 17 (1907), No. 11, pp. 593–621, pls. 21*).—In this article the author describes the equipment of the São Paulo station for animal production, the work in animal breeding and dairying, and related matters.

Annual reports of the live stock associations of the Province of Ontario, 1906 and 1907 (*Ann. Rpts. Live Stock Assocs. Ontario, 1906–7, pp. 272*).—Reports and papers presented at meetings of different provincial live stock associations and similar matters are included.

Animal husbandry in Denmark, 1906, A. Appel (*Tidsskr. Landökonom., 1907, No. 7, pp. 401–417*).—A general survey.

Notes on stable ventilation, Noack (*Deut. Landw. Presse, 34 (1907), No. 103, pp. 811, 812*).—Conditions necessary to proper ventilation and simple means of securing it in stables are briefly discussed in this article.

History of Shorthorn cattle, edited by J. Sinclair (*London, 1907, pp. XIV+895, pls. 62, map 1*).—The object of this volume has been to "place on record as many facts as could be obtained regarding the work of the early breeders, and the development of the breed throughout the wide regions where it is cultivated. No attempt has been made, or, indeed, could have been made, in a single volume of reasonable size to also furnish detailed accounts of existing herds or of those recently broken up. A good many of them have, however, been briefly alluded to, and a list of existing herds in the United Kingdom is also printed."

Feeding blackstrap molasses to young calves, T. E. Woodward and J. G. Lee, Jr. (*Louisiana Stas. Bul. 104, pp. 3–38*).—In this test 13 calves were used, the younger calves being fed 4 to 6 lbs. of skim milk twice daily and the older ones 6 to 8 lbs. Oat hay and crab grass hay were also fed as well as a grain mixture consisting of bran, corn meal, and oil meal 2:2:1, the young calves receiving all the hay and grain they would eat up clean and the older ones about 2 lbs. of grain per head daily. The amount of molasses varied but in no instance did it fail to scour the calves, the amount required to produce this effect varying from 0.05 lb. with very young calves to 0.7 lb. with calves 7 months old. The molasses used at first was slightly sour, but this was not the cause of the scouring as the same effect was noted when fresh molasses heated to a temperature of 180° F. or more was used. Exercise made no difference and granulated sugar produced scouring when an amount equivalent to that contained in the molasses was fed. Milk sugar also proved laxative, but about twice as much as of the cane sugar could be fed without this effect. "When the calves scoured their droppings were sour smelling, but when they did not scour, their droppings did not smell sour."

Several substances were tested as preventives of scouring. Formalin, blood meal, and limewater proved useless. Common salt had a slightly beneficial effect and 50 grains of tannin in some cases permitted the feeding of about one-half more molasses than was possible without it. In other cases it seemed to be without effect. All of these substances, as well as the sugar and molasses, were fed mixed with the milk.

The authors conclude that "on account of its laxative effect, blackstrap molasses can not be used as a supplement to skim milk for calf feeding purposes in sufficient quantity to be of any practical value.

"This laxative effect is due to the sugar content, rather than to any of the other constituents of the blackstrap.

"Scouring is caused by the fermentation of the sugar in the digestive tract.

"Salt and tannin have a beneficial effect, but will not prevent scouring."

The bulletin contains an introduction by W. H. Dalrymple in which the desirability of supplementing skim milk by inexpensive feeds is discussed.

Milk substitute for calf feeding, T. E. Woodward (*Louisiana Stas. Bul. 104, pp. 39, 40*).—Brief statements are made regarding the use on a Louisiana farm of bean soup, with shorts, blood meal, and sometimes cotton-seed meal gradually substituted for milk in calf feeding. The calves were encouraged to eat hay as soon as possible, alfalfa being preferred with peavine hay as second choice.

The method of making the soup which has been found successful is to parboil the beans with soda, drain and boil again until soft. After squeezing the beans through a colander salt is added until the soup has a decidedly brackish taste

and then the shorts, blood meal, cotton-seed meal, and lukewarm water are added. At the end of 10 days the calves received twice daily, in addition to a pint of milk, soup from 4 oz. of navy beans, 3 oz. shorts, 1 oz. blood meal, and about half the time 3 oz. of cotton-seed meal. "The calf receives this ration until it is 6 weeks of age, when the milk is discontinued and the same amount of the substitute fed as before until the calf is 4 months old, when it is weaned, that is, put on dry feed entirely."

Observations on sheep breeding from records of the University flock, G. C. HUMPHREY and F. KLEINHEINZ (*Wisconsin Sta. Rpt. 1907, pp. 25–40*).—From the station records, which have been kept for 240 ewes and which cover a period of 5 years in continuation of previous work (E. S. R., 14, p. 685), the following conclusions were drawn:

"The normal period of gestation, or the time from which a normal ewe is bred to the time of lambing, ranges from 145 to 151 days, and the greatest percentage of ewes will lamb 147 days after service.

"The gestation period appears to be somewhat longer for the male than for the female.

"The percentage of males born is practically the same as that of females.

"The larger percentage of lambs born on or before the 147th day of pregnancy is strong, and after this time the number of weak and dead lambs is greatly increased.

"The number of days a lamb is carried in utero does not seem to have any effect on its size.

"The largest percentage of increase is due to twin lambs, and there is no appreciable difference in the percentage of twins of the different breeds.

"The production of twin and triplet lambs is detrimental to the strength and vitality of lambs at birth.

"Shropshire ewes appear to be more prolific than any other breed.

"Ewes 6 years old produce the largest percentage of increase, while young ewes have the greater percentage of single lambs. The percentage of ram lambs increases and the percentage of ewe lambs decreases as the age of the ewe advances.

"A ram is at his best at 2 and 3 years of age.

"The age of the ram does not have any effect on the sex of the offspring.

"Ram lambs average about one-half pound heavier at birth than ewe lambs.

"The larger the ewe the greater the percentage of increase, while the ram has no effect on the lambs in this respect.

"The size of the ewe and not the size of the ram determines the size of the lamb."

Notes on goat keeping, V. NAUCKHOFF (*Meddel. K. Landtbr. Styr. [Sweden], 1907, No. 10 (129), pp. 28, pl. 1*).—The data reported were collected on a trip to Schleswig-Holstein and North Germany.

The value of different kinds of green forage for hogs, H. J. WATERS (*Missouri Sta. Bul. 79, pp. 3–12, figs. 6*).—Corn meal with rape, alfalfa, red clover, and blue grass was fed in comparison with corn meal and ship stuff 3:2, and corn meal and skim milk 1:3 in a test made with 6 lots of 6 pigs, weighing about 50 lbs. each. The test covered 102 days. The lots were kept in separate pens with a shed for protection and the green forage was given twice daily in a separate trough immediately after cutting.

"It was not expected that in ordinary farm practice the green material would be cut and fed to the hogs in this manner. At the time the experiment was undertaken, however, it was not feasible to fence off areas of each of these forage crops and graze them."

On corn meal and middlings the average daily gain was 0.61 lb. per head, the cost of a pound of gain 3.99 cts., and the grain eaten per pound of gain 4.89 lbs. On corn meal and skim milk the average daily gain was 1.53 lbs. per head, the cost of a pound of gain 2.17 cts., and the grain eaten per pound of gain 1.86 lbs. On the corn meal supplemented by green crops the gain ranged from 0.58 lb. per head on rape to 0.74 lb. on alfalfa. Of these rations, the gain was cheapest on the alfalfa, costing 2.59 cts. per pound, and most expensive on the rape, costing 3.31 cts. per pound. The greatest range in grain per pound of gain was also noted with these lots, being 3.43 lbs. with the alfalfa ration and 4.41 lbs. with the rape ration.

"It is believed to be possible to grow enough alfalfa for hog pasture at least on practically every farm in Missouri. Until, however, alfalfa is an assured success on every farm the farmer ought to arrange for a clover pasture for his hogs every year without fail. . . .

"It is not safe or even desirable to rely upon a single crop, excepting alfalfa where it is an assured success, to furnish pasture for our hogs throughout the entire season. It is better to arrange for a succession of pastures from the beginning of the season until the hogs are ready for market, making the feed richer and more concentrated toward the close of the season and as we approach the finishing or fattening period. For this purpose the following crops are recommended: Red clover or alfalfa, cowpeas, soy beans.

"To provide a crop of cowpeas in the best condition for the hogs, it will be necessary to select some very early maturing sort and sow rather earlier than is advised for a general crop. . . .

"For the best results the hogs should not be turned on the peas until the first pods are turning yellow. They will, however, make good pasture before this time, and if the hogs are needing pasture it is not advised to wait until that stage of maturity. . . .

"As a grain crop to use in connection with corn for crowding the spring crop of pigs to market, the soy bean is a very valuable crop. It is essentially a grain plant, very rich in protein, and while the hogs are running on soy beans they should have access to corn to balance the ration."

The author recommends that medium early corn, which ripens about the same time as soy beans, be fed with them, the two crops being sown together and harvested by the pigs. The pigs should be turned into the field when the first soy bean pods begin to ripen.

"The soy bean is regarded as somewhat better adapted for finishing a bunch of hogs than the cowpea; at the same time if one does not care to bother with so many different crops, the cowpea may be used instead with satisfactory results.

"For brood sows in winter and very early spring, it is always advisable to give them access to a piece of early sown wheat or rye, and to let them have a limited amount of nicely cured clover, alfalfa or cowpea hay by way of variety of feed. Sorghum stalks grown as is customary for the production of sirup, in limited quantity, make an excellent addition to the ration. The main thing to be avoided in carrying hogs of this sort through the winter is a straight corn diet. The greater the variety of cheap materials like these, the better the sows will do."

Pig fattening tests. Hinrichs (*Landw. Wchnbl. Schles. Holst.* 57 (*1907*), *Nos.* 48, *pp.* 797–800; 49, *pp.* 823–825).—A variety of rations, all of which contained potatoes as a prominent constituent, were tested with a number of lots of pigs. The results, in the author's opinion, demonstrate the high value of potatoes for fattening pigs.

Corn to make a pound of pork, G. HENDRICKS (*Breeder's Gaz., 53 (1908), No. 4, p. 177*).—A brief note on the amount of corn required per pound of gain in feeding pigs. A pen of 11 Duroc-Jerseys fed 62 days gained 800 lbs. and required 6.71 lbs. corn per pound of gain. A lot of 15 Poland-Chinas fed 35 days gained 585 lbs. and required 4.96 lbs. of corn per pound of gain. A little skim milk was fed once a day in addition to the corn and the pigs had the run of a pasture.

Meat meal for pigs as compared with ground grain, I. STEFFENS (*Illus. Landw. Ztg., 27 (1907), No. 39, pp. 356, 357*).—Although satisfactory results were obtained in feeding 1.5 to 3 lbs. of meat meal per head per day in comparison with a similar ration without this material, the author concludes that smaller amounts are more desirable and recommends 0.5 lb. per head per day.

Notes on swine management, W. A. LINKLATER (*Washington Sta. Popular Bul. 4, pp. 4, figs. 2*).—Various questions concerned with pig management under local conditions are discussed and especially the use of forage crops, peas, corn, kale, white and Swede turnips, and hairy vetch. The use of artichokes in the drier semiarid regions is also spoken of.

The portable hog house, J. G. FULLER (*Wisconsin Sta. Rpt. 1907, pp. 41–43, fig. 1*).—A summary of data previously noted (E. S. R., 19, p. 774).

The horse book, J. H. S. JOHNSTONE (*Chicago, 1908, pp. 299, pls. 51*).—This volume, which is designed primarily "to be of practical value to those who have in view the production of the types of horses in general request upon the farms and in the market places of the United States," takes up the origin and breeding of horses, the characteristics of the different breeds, hygiene, unsoundness, and disease. An appendix gives the stallion lien laws of all States and Territories where such legislation has been enacted and a list of stud books recognized by the United States Department of Agriculture.

Breeds of horses, C. G. WRANGEL (*Die Rassen des Pferdes. Stuttgart, 1908, vol. 1, pp. VIII+632, pl. 1, figs. 87*).—The origin, history, and characteristics of different breeds of horses are considered in this extended treatise.

Report of the department of horse breeding, A. S. ALEXANDER (*Wisconsin Sta. Rpt. 1907, pp. 44–46*).—A brief summary of data relating to the licensing of stallions and State legislation on the subject, as given in previous publications (E. S. R., 18, p. 764; 19, p. 774).

Horse raising in Denmark, 1906, J. JENSEN (*Tidsskr. Landökonom., 1907, No. 7, pp. 385–400*).—A general discussion of the conditions of the industry during the year.

Economical horse feeding in the brewing industry (*Allg. Brau u. Hopfen Ztg., 48 (1908), No. 9, pp. 85–87*).—The economical feeding of horses is discussed, especially with reference to the substitution of other materials for oats.

Substitutes for oats in horse feeding, H. KÖNIG (*Deut. Landw. Presse, 35 (1908), No. 2, pp. 13–15*).—A summary and discussion of data on the value of oil cakes, meat meal, dried brewers' grains, dried distillers' grains, and other materials as substitutes for oats in horse feeding. A number of rations are suggested in which oats are in part replaced by other concentrated feeds.

Report on the poultry industry in Denmark and Sweden, E. BROWN (*London, 1908, pp. X+112, pls. 16, fig. 1*).—On the basis of information gathered on a tour through Denmark and Sweden, the author discusses poultry breeding, care and management of poultry, and marketing of poultry and eggs in these countries, and related questions. In his judgment, the British poultry raiser has not much to learn from Denmark and Sweden as regards production, and in some instances he considers that the English methods are preferable. "But the main value of these observations is in regard to the widespread and almost

perfect system of marketing, which has been the means of securing for Danish eggs so high a position on the British markets, and is doing the same for Swedish. . . .

"The establishment of breeding centers has had a powerful influence in the improvement of Danish and Swedish poultry, more especially in the direction of economic qualities, and the distribution of eggs for hatching and stock birds from such centers has maintained the character and increased the average productiveness of the fowls kept by farmers. . . . In Denmark and Sweden success has been largely due to adoption of preservation of all eggs produced in the spring beyond those which can then be sold at adequate prices." Generally speaking, the eggs are preserved in limewater.

"These observations in Denmark show the value of maintaining separate central organizations for the promotion of poultry keeping and the sale of eggs and poultry, from those chiefly engaged in the purchase of general agricultural supplies, as the trade requires expert knowledge and undivided attention, but that in local societies the work of collection may be associated with other branches of agricultural produce."

Progressive poultry culture, A. A. BRIGHAM (*Cedar Rapids, Iowa, 1908, pp. 293, pl. 1, figs. 29*).—The author has summarized and discussed data, much of it based on personal experience, regarding the principles and practice of poultry breeding, incubation, brooding, foods and feeding, parasites and diseases, marketing, housing and fencing poultry, and related questions, as well as the exhibiting, scoring, and judging of poultry. A novel feature of the volume is the section devoted to records, accounts, and advertising in relation to the poultry business, and to methods of management of the poultry industry considered as a business enterprise.

The perfected poultry of America, T. F. MCGREW and G. E. HOWARD (*Washington, D. C., 1907, pp. 257, pls. 117*).—As described in the subtitle, this is a concise, illustrated treatise of the recognized breeds of poultry, turkeys, and waterfowl. Information is also included regarding guinea fowl.

Cost of feeding chickens, E. and W. BROWN (*Jour. Bd. Agr. [London], 14 (1908), No. 10, pp. 611–614*).—In a test carried on at the college poultry farm of University College, Reading, 25 White Wyandottes, 4 weeks old, fed for 12 weeks mixed meal, meat, and grit from hoppers, gained on an average 4.1 oz. per week each. The total feed consumed was 171.25 lbs. mixed meal, 63 lbs. meat, and 47 lbs. grit, and its total cost was $6.47.

In comparison with earlier work (E. S. R., 17, p. 797) the feed was expensive, but the added cost was more than compensated for by the increased gain in weight. "Hence it is apparent that the hopper system of feeding and the use of dry mash are worth the attention of poultry breeders and deserve a fair trial. Whether the food supplied could not be cheapened remains to be tested."

The production of table poultry, F. G. PAYNTER (*Country Life [London], 23 (1908), No. 577, pp. 136–138, dyms. 3*).—A brief summary of poultry feeding experiments undertaken on the Farne Islands, which the author discusses in comparison with the University of Reading poultry work.

Notes on the preservation of eggs in water glass, J. HENDRICK (*Aberdeen and No. Scot. Col. Agr. Bul. 8, pp. 12–17*).—A brief account of an investigation noted from another source (E. S. R., 18, p. 1149).

Pheasant farming, G. M. SIMPSON (*Corvallis, Oreg., 1908, pp. 26, figs. 10*).—On the basis of the author's experience in pheasant raising in Oregon the feeding, care, and management of these birds are described.

DAIRY FARMING—DAIRYING.

The university dairy herd, 1906–7, G. C. Humphrey and F. W. Woll (*Wisconsin Sta. Rpt. 1907, pp. 47–75, pl. 1, figs. 13*).—The records of the herd are reported and discussed as in previous years (E. S. R., 18, p. 1076).

The herd included 9 Jerseys, 8 Guernseys, 10 Holsteins, 4 Ayrshires, and 3 Brown Swiss. Descriptions are given of 14 of these cows added to the herd during the year. Data showing the food consumption and yield per cow are given for 23 cows, for which a full year's record was obtained. The average yield of milk per cow was 7,413.9 lbs., containing 308.37 lbs. of butter fat. The average net profit per cow was $44.20, or $3 more than during the preceding year.

A summary of the data comparing the returns from the different breeds shows that the cows ranged in production of milk as follows: Holstein, Brown Swiss, Guernsey, and Jersey; in production of butter fat, Guernsey, Holstein, Jersey, and Brown Swiss; in cost of feed, Jersey (lowest), Guernsey, Brown Swiss, and Holstein (highest); and in average net profit Guernsey, Holstein, Jersey, and Brown Swiss. The analyses of the various feeding stuffs used are recorded.

Tests of dairy cows, 1906–7, F. W. Woll and R. T. Harris (*Wisconsin Sta. Rpt. 1907, pp. 76–82*).—The so-called official and semiofficial tests of dairy cows were continued during 1906–7 as in previous years (E. S. R., 16, p. 813), 213 of the former and 756 of the latter with 345 different cows being conducted. A brief report of the work done in this connection is given.

The records of production made by Colantha 4th's Johanna (H.-F. H. B., 48577), 1906–7, F. W. Woll (*Wisconsin Sta. Rpt. 1907, pp. 83–88, pl. 1*).—The official 7-day, 30-day, and 63-day tests of this cow during the year 1906–7 are given. During the 10 months of the semiofficial record this cow produced 23,981.4 lbs. of milk, with an average fat content of 3.65 per cent, yielding 875.71 lbs. of butter fat.

The Jerseys at the St. Louis Exposition (*New York, 1906, pp. 121, figs. 27*).—An account is given of each cow in the Jersey herd included in the dairy-cow demonstration at the St. Louis Exposition. The productive record and breeding of each cow is reported by R. M. Gow, and the feeding and handling of the cows during the test are described by H. G. Van Pelt. The returns by these and three other herds of different breeds in the same test are summarized and compared.

Bacterial content of machine-drawn and hand-drawn milk, E. G. Hastings and C. Hoffmann (*Wisconsin Sta. Rpt. 1907, pp. 214–223*).—The data reported indicate that if the proper attention is paid to the cleanliness of the milking machine, milk may be produced by machine milking with as low a germ content as, or even lower than, that drawn by hand. To maintain the milking tubes and other parts of the machine in a bacteriologically clean condition the investigators used lime water prepared from fresh unslaked lime.

Distribution of cell elements in milk and their relation to sanitary standards, H. L. Russell and C. Hoffmann (*Wisconsin Sta. Rpt. 1907, pp. 231–253.*)—The purpose of the investigations here reported was to obtain information that would be of use in establishing a rational standard for the leucocyte content of normal milk.

Attention was directed first to the study of the methods of examination. Comparative tests were made of the Doane-Buckley and the Stokes-Stewart methods of quantitative determinations of leucocytes in milk. The results obtained by the former method were considerably higher than those by the latter, and there

was also much more uniformity in the results of duplicate tests. In the data given for 23 tests the percentage variation in duplicates by the Stokes method was very large and averaged 112 per cent, while by the Doane method the largest variation was 20 per cent and the average only 5.6 per cent. A modification of the method introduced by the investigators, which consists in heating the milk sample to 60° or 70° C. previous to centrifugalization, affords even more uniform results, the variations averaging less than 3 per cent. This method as thus modified is therefore recommended in studies of this nature.

In the investigations reported the authors studied the effects of a variety of factors, as physiological conditions of the animal, the period of lactation, the condition of the udder, breed, age, and others, on the cell content of milk of apparently healthy animals.

In summarizing results of their investigations the authors state that much injury may come to the dairy industry through the enforcement of such quantitative standards for leucocyte content as have been hitherto adopted. Their results agree with those of other investigators in showing wide variation in results of examination, depending largely upon the method followed. From the studies according to the method they adopted their conclusion is that "there is a wide range in the cellular content of milks that are apparently normal and perfectly safe for ordinary use. In a number of instances this cell content has been found to be relatively low and constant, while in a large proportion of cases, wide fluctuations have been noted which were frequently much in excess of any standards that have heretofore been accepted. There are undoubtedly factors operative which underlie this peculiarity in the individual animals. From the studies made it appears evident that the milks of older animals are more likely to show a high cell content than younger stock, and that frequently this condition is associated with a previous udder disturbance, which in some instances may leave a more or less marked indurated condition in the udder. These temporary disturbances, which are really gargets of a physiological character, very soon disappear, and the milk becomes wholly normal, although the evidence of such slight inflammatory disturbances may continue for a considerable period of time. So far as we have been able to find, there is no adequate reason why milks from such animals as these should be excluded from ordinary domestic supplies.

"At the present time we do not feel that it is wise to formulate a quantitative standard to be used as a hard and fast line in the inspection of milk supplies. The most that can be said of leucocyte examinations at the present time is that they are suggestive rather than final."

Concerning the bactericidal property of perhydrase milk, H. Much (*Münchcn. Med. Wchnschr., 55 (1908), No. 8, pp. 384–386*).—The experiments reported give evidence of the bactericidal effect of fresh cow's milk in destroying typhus bacilli, *Staphylococcus aureus*, and coli bacilli. They also add experimental evidence to that previously contributed by Much and Römer (E. S. R., 18, p. 368) that the process of producing perhydrase milk does not destroy the antibodies. By this process it is possible to maintain a bactericidal action in the milk for 24 hours, which is not the case with ordinary raw milk.

Medical milk commissions and the production of certified milk in the United States, C. B. Lane (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 104, pp. 43, pls. 6, figs. 11*).—The writer gives a comprehensive account of the work of medical commissions and of the movement that has resulted in their organization in different cities, and he describes in considerable detail the conditions under which certified milk is produced in different parts of the country. A paper prepared by B. D. White shows an economical method for the production of certified milk as practiced several years at a certified dairy in Minnesota.

The variation in the composition of milk, A. LAUDER (*Edinb. and East of Scot. Col. Agr. Bul. 14, pp. 34*).—The present report contains the results obtained from July, 1906, to July, 1907, in continuation of work previously reported (E. S. R., 18, p. 768). Data regarding the yield of 22 cows of the ordinary dairy Shorthorn type, varying in age between 6 and 10 years, are given. On several occasions the mixed milk of the herd contained little more than 3 per cent fat, but it never fell below that standard. The 11 cows that remained in the herd throughout the entire year gave an average yield of 885 gal. of milk, with an average fat content of 3.49 per cent for the morning milking and 3.98 per cent for the evening milking.

Variations in the amount of casein in cows' milk, E. B. HART (*Wisconsin Sta. Rpt. 1907, pp. 111–116*).—This article has been abstracted from another source (E. S. R., 19, p. 776).

The chemistry of milk curdling, J. L. SAMMIS (*Wisconsin Sta. Rpt. 1907, pp. 171–189, figs. 10*).—From the data reported the author draws the following deductions:

"The coagulation of milk by different acids at fixed temperature requires quantities of the acids which are not chemically equivalent to each other.

"The quantity of any acid required to coagulate a given sample of milk is less at high temperature than at low temperature.

"Variations in the proportions of neutral salts, or water, or sugar, as well as acids, present in milk produce variations in the coagulation temperature of the milk. In alkaline milk, neutral salts affect the curdling temperature.

"The reaction of lime-water casein solution with acid, producing a milky white appearance, is shown to be strongly dependent on temperature.

"The theories of Hammarsten, Soeldner, Van Slyke, and Hart, and others to the effect that milk as well as lime-water casein solutions contain a compound of casein with one other milk constituent, as calcium phosphate or oxid, in definite proportions can not be reconciled with these facts.

"The reaction between milk constituents, acids, etc., in solution is reversible and the state of equilibrium among the dissolved substances is affected by changes of temperatures.

"It is easy to correlate all the known facts respecting the curdling of milk, if one accepts the view that chemical attractions hold all of the constituents of milk serum in union with each other.

"Expressed in terms of this theory, milk curdles whenever the chemical attractions of curd constituents for each other and of the whey constituents for each other become relatively stronger than those which bind curd constituents and whey constituents together."

In brief, in the author's opinion the theory that there exists in milk a definite compound of casein with calcium oxid or calcium phosphate, or any other single milk constituent is untenable, and the theory that coagulation depends on the removal of calcium oxid from a definite compound of casein naturally present in milk can not be maintained.

The coagulation of fresh and alkaline milks, J. L. SAMMIS (*Wisconsin Sta. Rpt. 1907, pp. 190–206, figs. 12*).—The data reported present "typical results showing the effect of neutral salts on the coagulation of sweet fresh milk and milk containing caustic alkali." These results resembled those obtained in the previous study with acidulated milk (see preceding abstract). The facts obtained confirm the conclusions there drawn, and "render it very certain that milk curdling does not depend upon the neutralization of lime alone but is a reaction in which all of the constituents of milk take part."

The effect of autolysis on the precipitogenic characteristics of milk, H. DE WAELE (*Biochem. Ztschr., 7 (1908), No. 4–6, pp. 401–406*).—According to the experiments reported the autolysis of milk increases its precipitogenic action.

The influence of the oxygen of the air upon fermentation by typical lactic-acid bacteria, G. KOESTLER (*Centbl. Bakt. [etc.], 2. Abt., 19 (1907), Nos. 1–3, pp. 40–49; 4–6, pp. 128–148; 7–9, pp. 236–255; 13–15, pp. 394–419, figs. 18; abs. in Hyg. Zentbl., 3 (1908), No. 18, p. 558*).—From the results of the investigations reported the author concludes that oxygen had a different effect upon different lactic organisms.

Bacterium güntheri was but slightly sensitive to free oxygen, whereas *Bacillus casei* ε was very sensitive. The effect on this organism varied according to the quantity of oxygen supplied. With an abundant supply fermentation was largely prevented; there was, however, a rich vegetative development of the organisms, but they were not healthy. A scanty oxygen supply was practically without effect. With intermediate aeration there was a maximum acid production and normal cell development. The results indicate that oxygen in large quantities had a toxic effect and in moderate quantities a stimulating effect. This phenomenon can not be explained by Beijerinck's microaerophilus hypothesis, because the same degree of acidity was produced under positive anaerobic conditions as with the free access of air. With controlled aeration the degree of acidity produced depended upon the temperature and the content of the nutrient medium in assimilable nitrogenous compounds. A continuous oxygen supply was not necessary for fermentation, an occasional exposure of the medium to air with shaking being sufficient.

Butter from sweet cream, A. T. CHARRON (*Rpt. Dairymen's Assoc. Prov. Quebec, 25 (1906), pp. 238–246*).—Results of experiments in making butter from sweet cream are discussed. It is claimed that the process is just as advantageous as that with ripened cream, and that the butter made from sweet cream is equally good when fresh and keeps good longer than butter from cream spontaneously fermented.

Influence of metals on the action of rennet, G. A. OLSON (*Wisconsin Sta. Rpt. 1907, pp. 134–159, figs. 7*).—The author summarizes information regarding a number of conditions which influence the action of rennet on milk and reports the results of investigations on the effect of different metals. Milk was kept in contact with copper, zinc, lead, nickel, aluminum, tin, iron, and platinum, and different kinds of glass for different periods of time and afterwards the time required for the coagulation of such milk with a standard solution of rennet under uniform conditions was observed to learn what influence, if any, these substances had on the action of the rennet and whether this was characteristic for each substance.

"The data given show beyond a doubt that metals in some way delay the coagulation of milk with rennet. Different milks respond differently; the most striking retardations were observed with pure nickel. The retardations that are most doubtful are those observed with platinum and tin. It is hardly conceivable that salts of platinum or tin should be formed by the acid of the milk. When tin is treated with lactic acid a slight visible corrosion takes place, while on the other hand platinum remains uncorroded."

The direct cause for retardation of rennet by metal was not ascertained. Practical application of the information obtained in these studies is made in avoiding the use of rusty cans or poorly tinned utensils in the creamery or cheese factory. "The quality of the milk will to a large extent depend upon the condition of utensils in which the milk is kept or hauled to the factory. The degree of influence of iron on milk will depend largely upon the temperature, the length of time kept, and the amount of surface."

The author suggests that the reason for a slow or retarded action of rennet, which cheese makers have often experienced, may be attributed to the action of iron in milk cans in poor condition, and not entirely to the amount of salts present in the milk as was formerly supposed.

Red spots in Emmenthal cheese, J. Thöni and O. Allemann (*Landw. Jahrb. Schweiz, 22 (1908), No. 2, pp. 46–52, pl. 1*).—Several cheeses from 4 to 5 months old showed on the cut surfaces round red spots scattered irregularly throughout the cheese, which were found to be due to *Bacterium acidi propionici* var. *ruber*. Microscopical, cultural, and biological chemical data obtained in the study of this fault in the cheese are given.

Investigation of Gervais cheese, L. Müller (*Molk. Ztg., 22 (1908), No. 18, p. 491*).—Analytical data are given regarding French Gervais cheese and cheese of the same sort made in Germany.

Regarding "short" cheese, F. W. J. Boekhout and J. J. O. de Vries (*Centbl. Bakt. [etc.], 2. Abt., 19 (1907), Nos. 21–23, pp. 690–696; 24–25, pp. 750–754, fig. 1*).—This article has been abstracted from another source (E. S. R., 19, p. 474).

An automatic cheese press, J. W. Moore (*Wisconsin Sta. Rpt. 1907, pp. 207–213, figs. 3*).—This article describes and illustrates a modification of the ordinary cheese press constructed to maintain automatically a constant pressure for any desired length of time. This is accomplished by means of a rope wrapped several times around a pulley attached to the screw of the press, which is horizontal, then passed through another pulley overhead, and having attached on the end a sufficient weight to maintain a desired torsion upon the screw. The press described has been in use for several months. The advantages in the use of this press are summarized as follows:

"By using the proper weight on the rope the cheese can be put under any required pressure.

"By insuring continuous pressure during the night the cheeses are more perfectly closed than is otherwise possible.

"When the continuous pressure device is used there is less loss of fat, because a lower pressure is applied to the warm curd than is required with the ordinary press."

VETERINARY MEDICINE.

Veterinary hygiene, M. Klimmer (*Veterinärhygiene. Berlin, 1908, pp. X+439, figs. 81*).—The purpose of this volume is to show how the principles of scientific hygiene may be so applied to the care and management of domestic animals as to avoid to some extent at least the occurrence and spread of infectious diseases. To this end the author presents a detailed account of the influence of various factors in the environment upon the health of animals, particular attention being given to the conditions under which infection takes place through the air, soil, water, and feeding stuffs. The harmful changes which foods may undergo are discussed in detail. A long list is also given of poisonous plants with notes on the symptoms produced by eating these plants and antidotes which may be used in counteracting their effects.

Wounds: Their treatment and some minor surgical operations, W. Robertson (*Agr. Jour. Cape Good Hope, 31 (1907), No. 5, pp. 534–542, pls. 3, figs. 3*).—Practical suggestions are given regarding methods of casting or otherwise confining animals for surgical operations. A number of simple operations are described, with directions for the treatment of wounds to prevent infection or other serious consequences.

Preventive inoculation of farm stock, W. Robertson (*Agr. Jour. Cape Good Hope, 32 (1908), No. 1, pp. 97–106, figs. 5*).—Detailed directions are given for vaccinating stock against pleuro-pneumonia, anthrax, and blackleg. The principles upon which the effectiveness of vaccination depend are discussed.

Veterinary division, J. A. Gilruth and C. J. Reakes (*New Zeal. Dept. Agr. Ann. Rpt., 15 (1907), pp. 361–397, pls. 4*).—The work of the veterinary staff during the year was largely confined to routine matters and the practical testing of methods for controlling diseases of animals. Brief notes are given on contagious abortion, tuberculosis, anthrax, blackleg, mammitis, renal congestion in lambs, *Strongylus capillaris*, maggot fly, and fluke worms in sheep, tumors, etc. Considerable attention is given to the study of acute stomatitis in lambs. The disease appears to be due to a Staphylococcus which exists in mammary lesions of the ewes. The organism is briefly described and an account is given of its biological characteristics.

Aggressins in barbone and their application as an immunizing agent, F. S. H. Baldrey (*Jour Trop. Vet. Sci., 2 (1907), No. 4, pp. 351–355*).—In a study of the possible value of aggressins in the production of immunity toward barbone, the author found that aggressin fluid could be easily obtained from inoculated rabbits, but that its prophylactic value was very slight. Furthermore, there appears to be great difficulty in obtaining it in large quantities free from contamination.

Granulous colpitis as a cause of sterility, L. Brante (*Svensk Vet. Tidskr., 12 (1907), No. 3, pp. 120–126*).—The occurrence of granulous colpitis as well as of other infections which cause pathological changes in the cervix uteri or ovaries may lead to sterility.

A mycosis affecting man and rats, A. Lutz and A. Splendore (*Centbl. Bakt. [etc.], 1. Abt., Orig., 45 (1907), No. 7, pp. 631–637, pls. 4*).—For several years the author has had opportunity to observe a mycosis which occurs spontaneously in rats and also occasionally in man. In rats the lesions are to be found chiefly on the limbs and tail. Edematous swellings and ulcers appear on the surface, some of them being of a fistulous nature. Infection may be transmitted in rats through the alimentary tract but the progress of the disease is slow. In man the ulcerous lesions appear largely on the hand and arm. The microorganism which produces this disease has been identified as a species of Trichosporium.

Cultivation of trypanosomes and vital coloration of these organisms, C. França (*Bul. Soc. Portugaise Sci. Nat., 1 (1907), No. 1, pp. 5–11, figs. 3*).—Particular attention was given by the author to the typanosomes which occur in frogs. It was found possible to stain these organisms while alive by means of anilin dyes, particularly pyronin. This method, however, was not successful in the case of the trypanosomes of dourine, for these organisms would not take the stain during life.

The trypanolytic power of serum in cases of experimental nagana, A. Rodet and G. Vallet (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 24, pp. 1225–1227*).—In a series of laboratory experiments it was found that in animals which show no crisis during the development of nagana, the trypanolytic power of the serum gradually increased from the time of infection until death. On the other hand, in animals in which a regular crisis occurs during the course of the disease, the trypanolytic power of the serum develops to a high extent at the time of the crisis.

The preventive and curative power of human serum in cases of nagana, O. Goebel (*Ann. Inst. Pasteur, 21 (1907), No. 11, pp. 882–910*).—As had been previously shown by Laveran, Mesnil, and others, human serum in the experiments reported by the author exercised a pronounced preventive and curative

power in mice and guinea pigs infected with *Trypanosoma brucei*. Human serum digested together with the trypanosomes at a temperature of 37° C. did not lose its preventive or curative properties nor did the parasites lose their virulence. The active power of human serum toward the trypanosomes of nagana was destroyed by subjection to a temperature of 64° C.

The treatment of experimental nagana, F. Loeffler and K. Rühs (*Deut. Med. Wchnschr., 34 (1908), No. 1, pp. 5–8*).—In a previous article on this subject (E. S. R., 19, p. 983), the authors reported striking success in the treatment of nagana by the use of arsenious acid. The present article is largely of a controversial nature by way of reply to criticisms of Laveran and Thiroux (E. S. R., 19, pp. 1081, 1182). The authors repeated their experiments and again came to the conclusion that experimental nagana might be certainly cured by the simultaneous use of arsenious acid and atoxyl.

The diagnosis of rabies, S. A. Gryuner (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 11, pp. 964–995*).—A long series of observations was carried out by the author in determining the reliability of various methods in the diagnosis of rabies. In some cases it is found possible to reach a positive diagnosis merely from a post-mortem examination. The presence of sugar in the urine in connection with other evidence may furnish a basis for a positive diagnosis, but the absence of sugar from the urine is not satisfactory proof of the nonexistence of rabies. Negri corpuscles could be recognized with certainty in a certain percentage of cases. The author considers, however, that the only absolutely reliable method is to be found in the inoculation of rabbits or other laboratory animals.

The etiology and diagnosis of rabies, N. Oreste (*Clin. Vet. [Milan], Sez. Prat., 30 (1907), Nos. 50, pp. 805–812; 51, pp. 821–826*).—It is recognized as a great desideratum in the study of rabies to devise a method of rapid diagnosis. The rapidity, however, is no more important than certainty in diagnosis, and in the author's opinion preference should be given to the method of inoculation of guinea pigs.

The effect of various chemicals upon rabies virus, C. Fermi (*Arch. Hyg., 63 (1907), No. 3, pp. 315–330*).—Fixed rabies virus preserved at the Pasteur Institute at Sassari maintained its virulence for 20 days as determined by inoculation of rodents. None of the pieces of rabid brain material preserved in glycerin retained their virulence to the twenty-fifth day. The incubation period of rabies produced from virus preserved in glycerin was 5 or 6 days and was, therefore, not different from ordinary virus.

The theory and practice of anti-rabic immunization, W. F. Harvey and A. McKendrick (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1907, No. 30, pp. 43, figs. 7*).—Extended observations were made on the infective power of rabies virus from dried spinal cords as compared with that of fresh virus. Tests were also made to determine the bearing of the rate of desiccaiton of the spinal cord upon the use of such material for immunizing purposes. It was found that there is a direct relation between infectivity and the duration of desiccation of nerve material. No evidence was obtained for the existence of a rabies toxin. There appears to be some advantage in favor of using fresh material in immunization for the reason that this method involves the introduction of less foreign nerve substance.

The action of bile on tetanus toxin, H. Vincent (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 36, pp. 623–625*).—In glass vessels bile exercised a strongly antiseptic effect upon tetanus virus. In guinea pigs, however, the result was far less satisfactory and bile was not capable of protecting the animal against fatal results from the tetanus toxin. It is believed that this fact is to

be explained by the great dilution in which the bile exists in the body of the experimental animal.

Action of the component elements of the bile on tetanus toxin, II. VINCENT (*Compt. Rend. Soc. Biol. [Paris], 63 (1907), No. 37, pp. 695–697*).—In continuation of the work noted above, it appeared desirable to determine the particular elements of the bile upon which its antiseptic property depends. A study of this problem showed that all of the essential elements of the bile possess an antitoxic power toward tetanus toxin. The antitoxic property of cholesterin is somewhat greater than that of lecithin and bile salts.

Experiments in the use of epsom salts in the treatment of tetanus, L. CRUVEILHIER (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 3, pp. 111–113*).—Several investigators have suggested the use of epsom salts in treating tetanus. This drug was tested by the author who administered it hypodermically to mice and guinea pigs in a 2 per cent solution. No beneficial results were obtained and the author concludes that in the treatment of this disease no dependence should be placed upon epsom salts.

Inoculation tuberculosis in cold-blooded animals, G. MORIYA (*Centbl. Bakt. [etc.], I. Abt., Orig., 45 (1907), No. 4, pp. 294–301, pl. 1*).—In a series of inoculation experiments the author found that human tubercle bacilli were by no means easily modified into the form of tubercle bacillus usually found in cold-blooded animals. The author believes that before such transformation can be assumed to be possible it is necessary that further careful experiments be carried out on this line.

Fetal tuberculosis in calves, H. L. ELLERMAN and H. C. DEWAAL (*Tijdschr. Veeartsenijk., 35 (1908), No. 4, pp. 213–217*).—A detailed description is given of the tuberculous lesions observed in a pregnant cow. The disease had become generally distributed throughout the organs of the body and had affected the uterine cotyledons, from which pure cultures of tubercle bacilli were obtained. From these points the infection had spread to the fetus, causing characteristic lesions in various lymphatic glands.

The influence of wounds on the localization of tuberculosis, A. RODET and JEANBRAU (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 26, pp. 1361–1363*).—It has sometimes been assumed that tubercle bacilli possess a tendency to become localized in wounds which exist at the time of infection or arise subsequently. The author's experiments on rabbits led to negative results in this regard. Tubercle bacilli introduced through the alimentary tract led to distinct lesions in the lungs, but did not produce any subsequent lesion in artificial wounds in the joints.

The action of chlorin on the tubercle bacillus, G. MOUSSU and GOUPIL (*Compt. Rend. Acad. Sci. [Paris], 145 (1907), No. 24, pp. 1231, 1232*).—In the opinion of the author it has been shown that the acid-resisting property of the tubercle bacillus depends not alone upon its content of fatty substances, but also upon its protoplasm and other chemical constituents. The author found that if cultures of tubercle bacilli be subjected to the action of chlorin fumes the acid-resisting power of the bacilli disappears rapidly.

The formation of antibodies from the substance of the tubercle, E. BERTARELLI (*Centbl. Bakt. [etc.], I. Abt., Orig., 45 (1907), No. 1, pp. 62–67*).—During the development of the tubercle in susceptible animals the process is not confined to alterations of the tissues as a consequence of necrosis or other pathological changes, but under the influence of the bacterial invasion molecular combinations occur which result in new bodies previously not to be found either in bacterial cultures or in the tissue of the animal organism. These antibodies may possibly prove of some service in the production of immunity.

Tubercle toxin studies, II, A. H. Haentjens (*Ztschr. Tuberkulose, 11 (1907), No. 4, pp. 323–331*).—Suspensions of tubercle bacilli in physiological salt solution, glycerin agar, cultures of tubercle bacilli, and cultures of glycerin and potato were kept in a filter in an autoclave for 14 to 30 days. During this time the filtrate contains the true toxin of the tubercle bacillus. The material is called filtrase by the author and varies in strength according as the cultures are made in physiological salt solution, glycerin agar, or glycerin and potatoes.

This material was tested first on healthy and tuberculous guinea pigs with encouraging results. In healthy guinea pigs it was possible to administer doses of reasonble size without producing either toxic or thermic effects. In larger doses of a stronger filtrate, the material produced only slight toxic reaction. In the case of tuberculous guinea pigs, the use of this material caused an improvement of the general condition or a complete cure.

The material has also been tested on tuberculous human beings with satisfactory results.

Cultures of tubercle bacilli in vivo and vaccination against the disease, G. Moussu (*Rec. Méd. Vét., 84 (1907), Nos. 21, pp. 701–712; 23, pp. 770–776*).—In the investigations reported in this article the author was concerned in obtaining evidence on the influence upon the animal organism of the prolonged cultivation of tubercle bacilli in the peritoneal cavity. In the case of dogs it was found that the cultivation of tubercle bacilli in vivo for a period of 1 to 10 months did not increase the resisting power of the dogs toward inoculation with human tubercle bacilli.

Vaccination against tuberculosis, E. Leclainche (*Rev. Gén. Méd. Vét., 10 (1907), No. 119, pp. 585–597*).—The author reviews in a critical manner the results obtained by other investigators and himself in testing the efficacy and practicability of von Behring's method of vaccination against tuberculosis, and concludes that at the present time the only reliable and well established methods for controlling tuberculosis are the systems of isolation recommended by Bang and Ostertag.

Tuberculosis tests for 1906–7, H. L. Russell (*Wisconsin Sta. Rpt. 1907, pp. 224–230*).—A systematic effort is being put forth by the station to popularize and extend as widely as possible the application of the tuberculin test to dairy herds as a basis for the control of tuberculosis. The number of animals tested is increasing rapidly from year to year. Statistics are given showing the number of herds and number of animals tested from 1901 to 1907. In 1901 the number of cows tested was 425 and in 1907, 10,740. The percentage of tuberculous animals as shown by these tests varied from 2.7 to 19.7. The distribution of tuberculosis is shown by counties and also by regions in the State. The greatest prevalence of the disease is observed in the older dairy regions.

The extent to which the milk yield is affected by subcutaneous injections of tuberculin, E. Bohm (*Svensk Vet. Tidskr., 12 (1907), No. 6, pp. 241–248*).—In the experiments reported in this paper it was found that the milk yield may be considerably lessened as a result of tuberculin injections. With reacting cows the falling off in the milk flow appears within 2 or 3 days after injection and a return to the normal milk yield usually occurs within 1 week. In non-reacting cows there is no diminution in the milk yield, but, on the other hand, there may be a slight temporary increase.

Two new species of nematodes in the alimentary tract of cattle in Sumatra, A. Vryburg (*Centbl. Bakt. [etc.], I. Abt., Orig., 45 (1907), No. 4, pp. 321–332, pls. 5*).—An account is presented of the appearance, life history, and habits of *Strongyloides bovis* and *Agriostomum vryburgi*. Either of these parasites may

be transmitted to healthy cattle through the food and both species may occur simultaneously in the same animal. The symptoms of infestation are not particularly characteristic. In some cases, however, there is a chronic diarrhea which does not yield to treatment with the ordinary remedies. In attempts to treat animals for the parasites thymol, creosote, oil of turpentine, arsenic, and areca nut were used. The results were not satisfactory for either species, but were somewhat more encouraging in the case of *A. rrybnrgi* than with *S. bovis*.

Parturient paresis, Wagner (*Wchnschr. Tierheilk. u. Viehzucht, 51 (1907), No. 51, pp. 1006, 1007*).—In a series of 69 cases of this disease, the author carefully tabulated clinical and physiological data which might be considered of interest in the study of its nature.

The great majority of cases occurred in connection with the fourth or fifth parturition and cases were comparatively rare after the age of 13 years. In nearly all cases of the disease parturition was easy and occurred at the end of the normal term. No lesions occurred during parturition. The nutritive condition was in all cases excellent. In 64 of the 69 cases the udder was well distended with milk. The largest percentage of cases occurred in cows which had been dry for 2 to 3 months previous to parturition.

Poisoning of cattle with tansy. Wessel, Wilster, and Bugge (*Berlin. Tierärztl. Wchnschr., 1907, No. 49, pp. 879–881, fig. 1*).—Descriptive and clinical notes are given on a number of cases of poisoning of cattle with tansy. In one herd 43 per cent were affected and 25 per cent died. From post-mortem examinations it was impossible to observe any constant pathological lesions which were characteristic of the trouble. Notes are given on a number of other cases of this form of poisoning involving in all nearly 200 cattle. The symptoms as a rule are restlessness, irregularity of movement, blindness, twitching of the muscles, and dullness of the special senses. In some cases death resulted within 24 hours. Fairly satisfactory treatment was found in the use of tannin and barium chlorid.

Two undescribed diseases of sheep, T. H. Dale (*Vet. Rec., 20 (1908), No. 1018, pp. 490–492*).—The author has made observations on 2 new diseases of sheep in the Transvaal. The diseases have not been given a characteristic name. In both cases the mortality is very high and the course of the disease short. In one the period of incubation is about 4 days. This disease appears in flocks of sheep without regard to the degree of infestation by parasitic worms. The second disease attacks sheep in excellent condition, causing rapid prostration and death. The pericardium always contains a considerable quantity of fluid stained with blood. This disease is frequently associated with blue-tongue.

The stomach worm of sheep and goats, R. W. Dixon (*Agr. Jour. Cape Good Hope, 31 (1907), No. 6, pp. 637–642, figs. 11*).—The life history of *Strongylus contortus* is briefly outlined. In treating young lambs for infestation with this worm good results were had from the use of copper sulphate in doses from 2 to 4 oz. of a solution containing 1 lb. of copper sulphate and 1 lb. of mustard in 12 gal. of water. Mention is also made of the use of creosote and gasoline.

Ulcerous stomatitis of goats, C. Cadéac (*Jour. Méd. Vet. et Zootech., 58 (1907), Nov., pp. 656–659*).—Ulcerous stomatitis in goats as in other animals may be due to a variety of causes and sometimes appears to be of an infectious nature. A detailed account is given of a serious case occurring in a single goat in a herd, the ulceration in this case being apparently due to some caustic substance which the goat had taken with its food.

Lesions produced in the small intestine of swine by Echinorhynchus gigas, Weinberg and Romanovitch (*Ann. Inst. Pasteur, 21 (1907), No. 12, pp. 960–968, pl. 1, figs. 4*).—By means of gross and microscopic examinations of the

small intestine of swine infested with *Echinorhynchus gigas*, it was found that this parasite by attaching itself to the wall of the intestine may destroy in a mechanical manner the mucous, submucous, and even the muscular layer of the intestinal wall without producing any inflammation. The eosinophilous cells found near the point of attachment of the parasitic worms are apparently not attracted there by the presence of the parasites. *E. gigas* may produce lesions in which pathogenic bacteria find entrance to the host, causing infectious or necrotic enteritis.

Swine erysipelas. E. Césari (*Hyg. Viande et Lait, 1 (1907), No. 12, pp. 544–551*).—A considerable number of cases are cited in which swine erysipelas has been transmitted to man. The characteristic symptoms of the disease as observed in meat inspection are briefly outlined. The bacilli are not destroyed by the ordinary method of preserving hams until after at least 6 months, and the author recommends that pork affected with this disease should not be admitted for human consumption until it has at least been sterilized.

The occurrence of the bacilli of swine erysipelas on the intestinal mucous membrane and in the tonsils in healthy hogs. W. Pitt (*Centbl. Bakt. [etc.], 1. Abt., Orig., 45 (1907), Nos. 1, pp. 33–37; 2, pp. 111–121*).—In an examination of the intestinal mucous membrane in 66, and of tonsils in 50, healthy hogs, undoubted bacilli of swine erysipelas were found in 26 and 28 cases, respectively. The author concludes that the bacilli of swine erysipelas may occur in nearly 50 per cent of healthy hogs and that, therefore, prophylactic measures, such as have been commonly advocated, are of low value. It is, therefore, recommended that protective vaccination be adopted as the only reliable means of controlling this disease.

The behavior of white blood corpuscles in common diseases of the horse. E. Franke (*Monatsh. Prakt. Tierheilk., 19 (1907), No. 2–3, pp. 98–120*).—The variations which occur in the relative proportions of red blood corpuscles and the various kinds of leucocytes are presented in a detailed manner as observed in cases of pneumonia, influenza, petechial fever, tetanus, etc. Attention is called to the fact that in order to obtain reliable results from the examination of the blood the determination of the relative percentages of the different kinds of leucocytes must be made immediately after the blood is withdrawn.

The behavior of red blood corpuscles in surgical diseases of the horse, particularly in purulent inflammations. A. Gasse (*Monatsh. Prakt. Tierheilk., 19 (1907), No. 2–3, pp. 49–98, pl. 1*).—The content of red blood corpuscles in the blood is only slightly affected by the sex of the animal. The white blood corpuscles vary more extensively. The relative percentages of various kinds of white blood corpuscles in normal blood are given in a tabular form. In cases of purulent inflammation a hyperleucocytosis need not be considered especially serious if the relative proportion of the different kinds of leucocytes is not greatly disturbed. If, on the other hand, there is considerable increase in the number of neutrophil cells and a diminution in the number of lymphocytes, prognosis is quite unfavorable. The basophil cells appear in nearly all cases to vary in the same manner as the eosinophils.

Studies on glanders. V. Galtier (*Jour. Méd. Vét. et Zootech., 59 (1908), Jan., pp. 1–5*).—Glanders bacilli in small pieces of infected tissue are rendered entirely sterile by submerging in glycerin for a period of 12 days. The attenuation of the bacilli progresses gradually during this period. Dead glanders bacilli are toxic, and in the author's experiments they were shown to possess considerable toxicity after their virulence had entirely disappeared. No satisfactory results were obtained in immunizing dogs and guinea pigs against glanders.

The toxin of glanders bacillus, R. Turró (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 3, pp. 130, 131*).—The author describes the technique for obtaining a new form of mallein or toxin from the glanders bacillus which acts as an aggressin.

Abscess formation in the hypoglossal glands of horses affected with glanders, E. Lienaux (*Ann. Méd. Vét., 56 (1907), No. 12, pp. 645–648*).—It is commonly stated that the glanderous process in the lymphatic glands of the horse does not lead to formation of abscess. As a rule at least, this statement is true. The author reports, however, one case in which the hypoglossal glands were extensively affected with abscess.

Combating glanders in Dutch East Indies, W. Van der Burg (*Tijdschr. Veeartsenijk., 35 (1907), No. 3, pp. 149–151*).—From a report of the occurrence of glanders in the Dutch East Indies and the methods of control adopted in Java, the author maintains that the system is altogether too lax and that unless mallein is more extensively used as a diagnostic agent and the necessary quarantine measures carried out, it will be impossible to control the disease.

A study of the toxin in ulcerous lymphangitis of the horse, Dassonville (*Bul. Soc. Cent. Méd. Vét., 84 (1907), No. 24, pp. 576–582*).—The author describes the methods used in isolating and studying the toxin of ulcerous lymphangitis. It is found that the bacillus of this disease produces a very active toxin, to which guinea pigs and rabbits are very susceptible, dogs and cats less susceptible, and white mice almost if not quite refractory. The action of the toxin is readily modified by heat or by the use of various acids.

The symptoms and lesions produced by the toxin closely resemble those which occur as a result of diphtheria toxin, and the properties of the toxin as a whole indicate that it is very similar. The similarity is particularly evident from the fact that diphtheria antitoxin greatly modifies or counteracts the toxin of ulcerous lymphangitis.

The treatment of mange in dogs, Dietz (*Berlin. Tierärztl. Wchnschr., 1907, No. 48, p. 867*).—In treating mange due to Acarus mites the author has found it desirable to shear the hair as closely as possible from infected dogs after which a mixture of tincture of iodin and cream is thoroughly rubbed on the affected parts.

Piroplasma canis and its life cycle in the tick, S. R. Christophers (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1907, No. 29, pp. 83, pls. 3, figs. 4, charts 7*).—The literature relating to this protozoan parasite and related organisms is critically discussed in connection with an elaborate bibliography (pp. 67–77). In the tick *Rhipicephalus sanguineus* there are at least two means by which transmission may be effected. One is through the egg and the other a stage to stage infection. The latter has not been demonstrated experimentally, but must be assumed to be true from observations which have been made. The parasite passes through the same cycle of development in both methods of infection. In hereditary infection club-shaped forms originating from simple parasites penetrate the ova either in the ovary or in the lower passage of the oviduct.

[A bacterial growth on chickens], D. W. May (*Porto Rico Sta. Rpt. 1907, p. 15*).—A disease, seemingly a bacterial growth, has been noticed which produces lumps on the comb and at the base of the bill. Washing the heads of the fowls with a saturated solution of boric acid gave relief.

The persistence of contagion of fowl cholera, P. V. Sizov (*Arch. Vet. Nauk [St. Petersb.], 37 (1907), No. 10, pp. 847–850*).—It is commonly stated that after the occurrence of this disease an infected condition of the premises may persist for 3 or 4 months. In the author's experiments it was found that the

virus of fowl cholera preserved in glass vessels retained its virulence for 2 years.

Spirochetosis of Sudanese fowls—an after phase, A. Balfour (*Jour. Trop. Mag. and Hyg., 11 (1908), No. 3, p. 37*).—In continuation of his work in spirochetosis of fowls, the author has observed the parasitic organisms entering blood corpuscles. The organisms apparently degenerate after penetrating the corpuscles but the corpuscles also disintegrate. The fact is recorded that after the spirochetes had entirely disappeared from the peripheral blood they reappeared again in considerable quantities.

Some observations on swollen head in turkeys, G. S. Graham-Smith (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 227–243, pls. 2*).—A disease commonly known as swollen head of turkeys is described and notes are given on the symptoms usually observed and on the lesions as determined by an examination of a number of affected turkeys.

The most characteristic symptom is an extensive swelling about the head which becomes so enlarged that the birds are unable to see. The swelling is due to an accumulation of gelatinous substance in the infraorbital cavity. This swelling may disappear in a short time or may persist for several months. The swellings contain a cheesy foul-smelling material and death may take place without regard to the apparent severity of the disease. The lesions are confined to the head except for an occasional distension of the ceca. Bacilli related to the diphtheria bacillus are frequently found in the exudate, but no organism has been definitely shown to be the primary cause of the disease.

RURAL ECONOMICS.

Piece work in agriculture, G. Wasmuth (*Deut. Landw. Presse, 35 (1908), No. 33, pp. 358, 359*).—The author shows that the amount of work done and the wages earned by the average farm day laborer is the correct basis for determining the rate of pay for job workers in many of the operations of agriculture. The various classes of work both by hand and machinery that could be assigned as piece work in agriculture are enumerated, and the author advocates piece work rather than day work for farm laborers. It is maintained that where this class of work has been tried the piece workers accomplish more, earn more, live better than farm laborers paid by the day, and do equally good work. Where laborers are scarce piece work is regarded as a partial solution, because three men on piece work will accomplish as much as four ordinary day laborers. Moreover, the incentives of independence and higher wages as a result of piece work puts the agricultural industry on the same level as other industries so far as wages is concerned, and this is regarded as affording the brightest prospects in the future for retaining the young workers on the land.

The farm labor problem in the Empire State (*Amer. Agr., 81 (1908), No. 21, pp. 583, 584*).—This article contains brief statements from several farmers in different parts of New York State relating to the farm labor problem. The general trend of the replies indicates that good farm labor is scarce, that wages for day labor range from $1.25 to $1.50 per day, and monthly wages from $20 to $33 with board for 10 hours work per day, and that the scarcity of work in cities is bringing back to the farm those who were born and brought up thereon. The encouragement of the immigration of farm labor from the United Kingdom, Germany, Sweden, and other European countries and the greater use of farm machinery are advocated as a remedy.

Emigration to Virginia and the labor question, G. W. Koiner (*Rpt. Va. State Hort. Soc., 12 (1907), pp. 145–155*).—This is an address delivered before

the Virginia State Horticultural Society at its meeting held at Staunton, Va., December 5, 1907.

The paper deals with the personal efforts in northern Europe of the State commissioner of agriculture to induce farm laborers to emigrate to Virginia and of the results of the undertaking. In two seasons some five or six hundred persons had been located on Virginia farms, about 80 per cent of whom were doing well. "There are now a thousand or more applications in my office for farm labor that we can not fill. The work . . . shows a great demand for farm labor in the State of Virginia. We have about 125,000 farmers in Virginia, and about half of them want some help."

The Hungarian farm labor problem (*Wiener Landw. Ztg., 58 (1908), No. 26, p. 269*).—The writer shows that whereas during 1897 there were 14,310 emigrants from Hungary, the year 1906 showed 178,170, and that of the latter about 23,000 were peasant proprietors and 76,000 farm and day laborers. The wages of farm help has doubled during the past 15 years, and even if farm labor were available no remedy could be afforded by offering an increase in wages as they are as high now as the majority of farmers can afford to pay. The recent return of so many emigrants from the United States and other countries brought no remedy to farmers as the majority located and sought employment in industrial centers. The future outlook for agriculture in Hungary, therefore, is regarded as serious.

The agricultural holdings act, 1906, A. P. Poley (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 1–16*).—This is a discussion of the main provisions of the act which goes into operation on January 1, 1909. The features discussed relate (1) to those alterations in the law which amend preceding agricultural holdings acts, particularly the act of 1900, and (2) to those sections of the act which embody the ideas of the school of agricultural reformers responsible for its inception. The topics of interest to landlords and tenants relate to arbitration, repairs to buildings, record of holding, amendment of market gardeners compensation act, freedom of cropping, compensation for unreasonable disturbance, and compensation for damage by game.

The creation of small holdings under the act of 1907, Mrs. Roland Wilkins (*Jour. Bd. Agr. [London], 15 (1908), No. 1, pp. 1–7*).—This is a discussion of the natural, market, and other conditions which are necessary to the successful extension of small holdings in England.

The cooperative association movement relating to the grain industry in the United States, H. L. Rudloff (*Fühling's Landw. Ztg., 57 (1908), No. 9, pp. 321–334*).—The author discusses the origin, purpose, and development of several associations and cooperative societies in the United States with particular reference to the production, storing, grading, and marketing of wheat. Among the societies historically sketched are the Grange or Patrons of Husbandry, National Grain Dealers' Association, National Farmers' Alliance and Industrial Association, National Grain Growers' Association, Northwestern Independent and Farmers' Elevator Association, and the Cooperative Commission Company.

It is the author's opinion that the farmers of the northwest lack in the spirit of solidarity which has been so helpful in promoting agricultural cooperation in Europe. The spread of cooperation among grain producers it is thought would promote still more the advantages of increased prices already accruing to farmers as a result of this movement.

Agricultural mutual societies, H. Léraillé (*Fermes et Châteaux, 4 (1908), No. 33, pp. 232–234, figs. 7*).—This is a discussion of the origin and progress of mutual insurance and credit societies in France, including the underlying principles of organization, operation, assessment, payment of losses, etc.

The mutual insurance societies were instituted for the insurance of farm buildings against fire and storms, of live stock against loss from diseases or other causes, and of crops against storms, floods, and other natural forces. Since their origin in 1898 the mutual insurance societies have increased to 7,824 in May, 1907. The statistics of mutual credit banks have already been noted from another source (E. S. R., 19, p. 692).

The Utopia of agricultural credit, H. OESTREICHER (*Inaug. Diss., Univ. Freiburg, 1907, pp. 129*).—This is an inaugural dissertation dealing with the history of agricultural credit reform, from the efforts of Rodbertus in 1868 to the present time, with a critical discussion of the different systems and an estimation of their value.

[Cooperative societies in Bombay Presidency], C. S. CAMPBELL and J. E. C. JUKES (*Ann. Rpt. Work. Coop. Credit Soc. Bombay Pres., 1906–7, pp. 45+3, map 1*).—The total number of societies is 70 as compared with 31 in the preceding year, with a membership of 4,845. The maximum rate of interest is 12½ per cent, the lowest 6¼ per cent, and the average per society 8½ per cent.

Summary of the work of the agricultural commission during the year ended October 1, 1907 (*Aperçu des travaux des Commissions agraires pendant la première année de leur fonctionnement (jusqu'au 1-er Octobre 1907). St. Petersburg: Dir. Gen. Organ. Agraire et Agr., 1908, pp. 20*).—This report deals with the new land surveys in Russia, the modification of the rural land-tenure system, and the financial aid afforded the peasantry for improving their holdings under the terms of a royal decree issued March 17, 1906, and the law of May 9, 1906.

The agricultural budget for 1908, E. MARTIN (*Bul. Soc. Agr. France, 1908, May 1, pp. 811–816*).—This is a detailed discussion of the law relating to the government expenditures in France for the different branches of agriculture for the year 1908. The law carries for agriculture the sum of 46,005,594 francs (about $9,200,000), an increase of 850,448 francs over 1907, or 1.17 per cent of the total French budget.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 7, pp. 49–56*).—Crop acreages and conditions in the United States and foreign countries, and the value and prices of the principal agricultural products are reported to July, 1908.

Agricultural production in Russia in 1906 (*Separate from Statis. Empire Russ. 60 (1907), pp. IV+57, charts 13*).—Statistics of crop production are reported.

Agricultural statistics of Bengal for 1906–7 (*Agr. Statis. Bengal, 1906–7, pp. 68*).—Statistical data showing total acreage, classification of areas, crops, current fallows, etc., are reported.

Manual of world economics, edited by E. VON HALLE (*Weltwirtschaft, 2 (1907) pts. 1, pp. VI+368, pls. 2, figs. 8; 2, pp. VIII+284, dgms. 18; 3, pp. VI + 288*).—This publication gives a general review of the world's economic, social, and political conditions during 1906.

Part 1 contains an article by C. Ballod (pp. 64–84), which gives statistics on the production of cereals and other staple crops, meat production and consumption, and other data relating to agricultural products in the chief countries of the world.

Part 2 contains an article by W. von Altrock (pp. 5–63), which discusses the statistics of cereal and fruit production, number of live stock, dairy cooperative societies, agricultural credit societies, etc., in Germany.

Part 3 contains articles reviewing the economic and agricultural conditions in the United States, Europe, and the far east.

Bibliography of the price of cereals, J. A. P. Mackenzie and J. A. Baines (*Jour. Roy. Statis. Soc., 71 (1908), No. 1, pp. 178–206*).—This bibliography was presented by the Royal Statistical Society of London to the International Statistical Institute at the congress held at Copenhagen in August, 1907.

AGRICULTURAL EDUCATION.

Course in agriculture, S. B. McCready (*Ann. Rpt. Ontario Agr. and Expt. Union, 29 (1907), pp. 95–104*).—This is an outline of a two-year course in agriculture suitable for high schools and collegiate institutes. It includes suggestions for instruction in agriculture, physics, chemistry, botany, horticulture, agronomy, animal husbandry, dairy husbandry, poultry keeping, farm carpentry, and farm economics, items of equipment needed and their cost, and regulations to govern agricultural departments in high schools and collegiate institutes.

State facilities for viticultural instruction in Hungary, J. Wortmann (*Landw. Jahrb., 36 (1907), No. 5–6, pp. 788–792*).—An account of the work of the 27 viticultural inspectors in Hungary, the 8 secondary and elementary viticultural schools, the 4 communal viticultural schools, the Royal School for Cellar Masters at Budafok, near Budapest, and the Royal Central Viticultural Institute at Budapest.

French traveling agricultural domestic science schools, A. Ducloux (*Indus. Lait. [Paris], 33 (1908), No. 11, pp. 235–255*).—This article gives a brief history of itinerant instruction in agricultural domestic science in France, and an account of the organization, work of the staff, daily schedule, budget, and qualifications of students of these schools, results obtained in the departments of Oise, Pas-de-Calais, and Nord, and suggestions as to qualifications and preparation of teaching staff necessary to insure the success of this movement, together with the three months' course of study.

The teaching of agriculture, C. C. James (*Ann. Rpt. Ontario Agr. and Expt. Union, 29 (1907), pp. 75–94*).—The author calls attention to the failure of previous attempts at teaching agriculture in the public schools of Ontario in spite of the fact that three good text-books of agriculture have been prepared especially for these schools. He attributes this failure to the lack of rural school teachers having the training that would make them competent to handle the subject even when provided with text-books. He then outlines a new plan, which has recently been put into operation, viz, to start with 6 agricultural college graduates as teachers of agriculture in 6 of the high schools of the province. Reports are given from each of these teachers showing their work not only in the school but also among the farmers in their districts. These reports are followed by a memorandum by the author which was presented to the minister of agriculture in 1906 and which outlines their duties in considerable detail. These young men are not only teachers but local representatives of the department of agriculture, occupying positions very similar to those of departmental professors of agriculture in France.

Agriculture in public schools, A. D. DeWitt (*Cornell Countryman, 5 (1908), No. 6, pp. 187–189*).—This is a description of the 3-year course in agriculture given in the public high school at St. Louis, Mich.

Public school cookery, is it playing fair with the home and taxpayer? Mary B. Hartt (*Good Housekeeping, 46 (1908), No. 2, pp. 123–130, figs. 6*).—A discussion of instruction in cooking in the public schools as to whether it should be in the nature of practical cookery or to give a knowledge of the scientific basis of cooking, and whether or not the principles of cookery should be taught in the grades leaving the science for the high school. A comparison

is made of the fractional recipe or individual method with small amounts of materials and the group method with large amounts. The former method is favored by many. Active teachers agree that the school kitchen should not be expected to produce cooks any more than the manual training school should be expected to turn out fully equipped carpenters or machinists.

School gardening. LUCY R. LATTER (*Trop. Agr. and Mag. Ceylon Agr. Soc., 30 (1908), No. 2, pp. 155–158*).—In considering the place of school gardening in education the author states that a great deal of confusion and disappointment has resulted from the fact that people have not realized the difference between the two points of view from which gardening may be considered, viz, as a direct aim in itself and simply as a means toward a given end. "Experience proves that nature teaching or gardening should be the center point of all the other work of any school children up to at least 9 years of age, and it should certainly have a large place in the work of schools for scholars of more advanced age." The author describes the gardening work at her own school, in which the children are taken in small groups for work. It has been found that 8 or 10 children are all that one teacher can direct advantageously unless it be in such operations as weeding and watering. With 50 or 60 children the work becomes overorganized and its value is lost in drill.

School gardening at Greenville, Ohio. W. S. ROWE (*Ohio Ed. Mo., 57 (1908), No. 2, pp. 49–56, figs. 2*).—An account of the motives prompting the experiment, interest awakened in the homes, provision for ground, tools, and seed, the thoughtful planning and careful direction required, the vacation work (essentially truck gardening), the class of pupils electing the truck gardening, some problems which had to be solved, a device to keep up interest and enthusiasm, the cost of garden and its ample returns, and the economic, educational, and other results.

Arbor day—the American spring festival. W. C. LEE (*Forestry and Irrig., 14 (1908), No. 4, pp. 201–206, figs. 4*).—An account of Arbor Day observance in different States and what it has accomplished.

The farm boys' encampment. S. M. JORDAN (*Mo. Bd. Agr. Spec. Bul., 1907, Dec., pp. 21, figs. 5*).—This is an account of an encampment of farm boys on Glenview Farm, near McCurry, Mo., August 19–23, at which a corn show was held and entertainment and instruction were given. The instruction was on breeding and cultivating corn and demonstration of implements.

Proceedings of the spring meeting of Farmers' Annual Normal Institute and State Board of Agriculture. A. L. MARTIN (*Penn. Dept. Agr. Bul. 157, pp. 210, figs. 9*).—This bulletin includes the addresses and discussions at the meeting of the Pennsylvania State Board of Agriculture, Allentown, Pa., June 4, 1907. Among the addresses relating to agricultural education are the following: The Successful Farmer's Education, by W. S. Owens, and Rural Education, by A. C. True.

Bird life: Its relations to the farmer. T. H. SCHEFFER (*Industrialist, Agr. Ed. Ser., 1 (1907), No. 5, pp. 81–106, figs. 14*).—A study of bird life, in which the following phases are considered: Place of birds in the animal kingdom, their external structure and other structural features, their classification, the object of bird study, birds in their general relations to farm crops, migration, bird diaries, winter birds, some of our useful birds, birds of doubtful value, food habits, birds and the balance of power, natural enemies of birds, man as an enemy, nests and nesting, notes and colors, protecting and encouraging the birds, and how to study a bird. A list of reference material is appended.

The story of cotton. MARY C. BREEN (*Hampton Leaflets, n. ser., 4 (1908), No. 4, pp. 24, figs. 12*).—This circular is intended for the use of teachers and

includes 9 simple exercises on seed testing, depth of planting, some essentials for germination, how plants grow, disposition of surplus water in plants, effect of exclusion of air on plant growth, effect of too much water in soil, and where roots increase in length, as well as a study of the cotton plant in the school garden plat and of its products after it is picked.

Notes on drainage, E. R. JONES (*Madison, Wis., 1908, pp. 166, figs. 25*).—This is a text-book dealing with class-room, field, and laboratory exercises for students of land drainage. Preparatory to the lessons dealing strictly with drainage are a number of chapters on surveying, containing instructions concerning linear and angular measurements, subdivision of land, methods of mapping, the use of different instruments, and problems in surveying.

The lessons relating to drainage deal with moisture and its relations to the soil and methods of artificial drainage and principles governing it. Numerous exercises for practice are given.

MISCELLANEOUS.

Annual Report of Porto Rico Station, 1907 (*Porto Rico Sta. Rpt. 1907, pp. 55*).—This report contains, in addition to a summary by the director of the investigations conducted at the station, separate reports for the physiologist, horticulturist, entomologist and plant pathologist, and coffee expert, and an article on The Fermentation of Cacao and of Coffee. The experimental work reported is abstracted elsewhere in this issue.

Twenty-fourth Annual Report of Wisconsin Station, 1907 (*Wisconsin Sta. Rpt. 1907, pp. VII+137*).—This includes the organization list of the station, a report of the director on the work of the station during the year, numerous articles abstracted elsewhere in this issue, registers of licensed feeding stuffs and fertilizers and their guaranties, lists of exchanges and donations, and a financial statement for the fiscal year ended June 30, 1907.

Laws applicable to the United States Department of Agriculture (*Washington: U. S. Dept. Agr., Office Solicitor, 1908, pp. 255*).—A compilation of the provisions of law pertaining to this Department in force July 1, 1907.

The conservation of natural resources, G. PINCHOT (*U. S. Dept. Agr., Farmers' Bul. 327, pp. 12*).—An address delivered before the National Geographic Society, January 31, 1908, in which attention is directed to the necessity of immediate conservation of the natural resources. The concerted action of forestry associations, waterway associations, irrigation associations, and related bodies is suggested as a means of bringing about a new point of view on the part of the general public to lead to the adoption of a definite policy.

NOTES.

Connecticut College and Storrs Station.—G. H. Lamson, jr., instructor in geology, ornithology, entomology, and physiology in the college, has been appointed entomologist in the station. F. H. Stoneburn, formerly connected with the poultry work of the college and station, has been appointed poultryman, vice C. K. Graham, whose resignation has been previously noted.

Florida Station.—Alfred Dickenson has accepted the position of gardener, vice William Iless, whose resignation has been previously noted.

Georgia College.—The State general assembly has appropriated $105,000 for maintenance and improvements for the college of agriculture for the next biennium. It has also turned over the entire net proceeds from the oil and fertilizer taxes to the district agricultural schools. It is estimated that each school will receive $7,500 from this fund this year.

Guam Station.—In accordance with the current Federal agricultural appropriation act, authorizing the establishment of an experiment station in the Island of Guam, Dr. W. H. Evans of this Office visited the island the past summer and selected a site for the station at Agaña. The station will be conducted under the immediate supervision of this Office, with H. L. V. Costenoble as agent in charge.

Hawaii College.—B. E. Porter, assistant in animal husbandry in the Maryland College, has been elected professor of animal husbandry.

Hawaii Federal Station.—A new insectary, protected against insect pests by screens and by erection on ant-proof pillars, has been completed for use in the breeding work with injurious and beneficial insects. D. T. Fullaway has been appointed assistant entomologist in connection with the breeding work with scale insects and insects injurious to domestic animals, notably sheep maggot and horn fly.

At the urgent request of growers the station is to devote special attention to pineapple and rubber culture. With pineapples the work will include a study of the fertilizer requirements, the soil conditions which lead to yellowing, and pineapple diseases. Experimental plants covering 6 acres have been established on land furnished by two of the leading pineapple companies of the Island of Oahu, and arrangements have been made whereby a plant pathologist from the Sugar Planters' Station will cooperate in a study of pineapple diseases, the results to be published by the Federal Station.

With rubber, extensive investigations are contemplated as to the economics of the industry in the islands, the best methods of tapping, and various other points connected with the fertilization, cultivation, and care of rubber trees. The Board of Commissioners of the Bureau of Agriculture and Forestry has passed a resolution diverting, during the present fiscal year, $1,300 of its funds for the purpose, the work to be under the supervision of the station.

Hawaii Sugar Planters' Station.—C. F. Eckart, director of the division of agriculture and chemistry and business director of the station, has been given a year's leave of absence, during which Noël Deerr will act as director of the division of agriculture and chemistry and L. Lewton-Brain as business director.

The division of pathology and physiology has recently extended the scope of its work, and is investigating a serious disease of the forests of windward Maui. L. D. Larsen, a recent graduate of the Massachusetts College, has been appointed assistant pathologist in connection with this work and has entered upon his duties. W. R. Potter has been appointed illustrator, vice W. E. Chambers, who has accepted a similar appointment with this Department.

Purdue University and Station.—The school of agriculture and the station are planning a mammoth exhibit at the State fair, where a special building has been recently remodeled and equipped for the purpose by the State board of agriculture. Results of experiments will be presented by collections of grains and fruits, photographs, charts, and in similar ways. A special exhibit of stock feeds and fertilizers will be made and demonstrations in making and applying spraying mixtures, judging stock, and seed selection will be given daily. In the dairy division milk testing and separating, cream ripening, and butter making will be carried on throughout the week, and exhibits of butter, cheese, and dairy equipment will be open for inspection. Experts to answer questions and explain the work in detail will be available for each of the exhibits.

Carleton Cutler, of the Vermont Station, has been appointed assistant chemist.

Louisiana University and Stations.—Ernst A. Bessey, pathologist in charge of the Subtropical Laboratory and Gardens of this Department, has been appointed professor of botany in the university. In the Sugar Station H. P. Agee has been appointed assistant director to succeed R. E. Blouin, who has accepted the directorship of an experiment station in Argentina. Dr. Fritz Zerban has resigned as chemist to become director of the Sugar Experiment Station at Lima, Peru. R. E. Graham has been appointed assistant chemist. George Tiebout has accepted the position of assistant horticulturist of the stations and will be located at Roseland.

Massachusetts College.—The main section of the new college barn, erected in 1907 to replace a similar structure destroyed by fire, was burned to the ground on August 15, together with 13 head of live stock, about $4,000 worth of farm machinery, and $4,500 worth of hay. The cattle stable and dairy wing, separated from the main barn by a cement wall, escaped serious injury, as did also the cement silos. The total loss is estimated at about $27,000. The cause of the fire has not been determined.

W. P. B. Lockwood has been appointed assistant professor of dairying.

Michigan College and Station.—As a part of the extensive reorganization of the agricultural work, divisions of animal husbandry, dairy husbandry, soils and farm crops have been established, with H. W. Norton, A. C. Anderson, J. A. Jeffery, and the director in charge respectively of these divisions. H. J. Eustace, expert in fruit storage in the Bureau of Plant Industry of this Department, has been appointed professor of horticulture in the college and horticulturist in the station. Other recent appointments include the following assistants: M. A. Yothers, entomology; F. A. Spragg, farm crops; C. B. Collingwood, chemistry, and Misses Z. Northrop and L. M. Smith, bacteriology.

Mississippi College and Station.—Dr. J. C. Roberts, veterinarian, and Glenn W. Herrick, entomologist, have resigned, their resignations becoming effective September 15.

Missouri University and Station.—C. Stuart Gager, of the New York Botanical Gardens, has been appointed professor of botany in the university and botanist in the station. L. Haseman, assistant entomologist, and C. W. Rine, assistant animal husbandman, have resigned, the former to take up graduate work at Cornell University and the latter to engage in commercial work.

The station veterinarian is meeting with remarkable success in the inoculation of hogs against cholera, the work being done in conjunction with this

Department. The demand from farmers for the antitoxin has far exceeded the supply and efforts are under way to produce it in sufficient quantity. It is found that only limited amounts can be obtained from immune hogs, but it is hoped that other animals, possibly horses, can be utilized for the purpose.

The station correspondence with farmers is larger than ever before. This increase is ascribed to a great extent to the plan now being followed whereby each department has charge of the dissemination of its results through multigraph letters and similar means. The country newspapers of the State are also actively cooperating in the work, showing great willingness to publish notes of interest from the college and station.

Montana Station.—Edmund Burke, assistant chemist and meteorologist, has been appointed chemist, and Reuben M. Pinckney, assistant in chemistry at the University of Nebraska, has been appointed assistant chemist.

Nebraska University and Station.—C. W. Pugsley has been appointed associate professor of animal husbandry in the university and assistant in the station.

New Jersey Stations.—George G. Manning has resigned as field and greenhouse assistant and Arthur J. Farley, a graduate of the Massachusetts College in 1908, has been appointed assistant horticulturist.

Cornell University.—Arrangements have been completed by the extension department whereby a special agricultural train is to be sent out over the lines of the Erie Railroad in the near future.

North Dakota College and Station.—According to a note in *Science*, F. J. Seaver, assistant botanist, has been appointed director of laboratories in the New York Botanical Garden. A $10,000 brick seed house and root cellar and a $2,000 machinery shed 40 by 112 feet have been completed, and the contract has been let for a horticultural green house to cost $6,000.

Oklahoma College and Station.—In accordance with a new State law, representatives from the various country farmers' institutes recently met at the college for the election of a State board of agriculture and the holding of a general round-up institute. The board of agriculture, which acts as the board of regents for the college and station, is now constituted as follows: J. P. Connors (president), Canadian; J. C. Elliott (vice-president), Pauls Valley; E. White (treasurer), McLoud; R. F. Wilson, Valliant; G. T. Bryan, Perry; D. Diehl, Hobart; T. Rice, Hitchcock; R. W. Lindsay, Choteau; A. C. Cobb, Wagoner; J. W. Corley, Howe, and F. Ikard, Chickasha.

W. L. English resigned as director of the station August 24 and B. C. Pittuck has been appointed acting director. W. T. McDonald has resigned as animal husbandman in the college and station and has been succeeded by W. A. Linklater, of the Washington College and Station, as previously noted. Cornelius Beatty has been appointed chemist in the station, vice A. G. Ford resigned, and R. O. Baird has been appointed assistant chemist. The department of botany has been transferred in both the college and station from the department of entomology to that of horticulture, and an additional assistant in horiculure, L. M. Montgomery, of the Colorado College, has been appointed.

The Cotton Conference and Cotton Grading School held at the college during August was largely attended. About 300 delegates and visitors registered for the first week of the conference, and about 100 farmers, merchants, bankers, and cotton buyers were in attendance during the two weeks of the school.

Pennsylvania College and Institute of Animal Nutrition.—Frank D. Gardner, of the Bureau of Soils of this Department, has accepted the professorship of agronomy in the college and has entered upon his duties. In the Institute of Animal Nutrition, John W. Calvin, of the Kansas College has been appointed assistant, vice F. W. Christensen who has been given a year's leave of absence

for study, and D. C. Cochrane and R. C. Jones have been appointed assistants, vice F. S. Putney and W. H. McIntyre, resigned.

Porto Rico Station.—George L. Fawcett, of the Subtropical Laboratory and Garden of this Department, has been appointed assistant in plant pathology and has entered upon his duties.

Clemson College.—D. N. Barrow, who has been engaged in the South in the farmers' cooperative demonstration work of this Department, has been appointed director of the agricultural department and professor of agriculture in accordance with the recent plan of providing separate forces for the instruction and station work in that State. He will enter upon his work at once. According to a note in *Science*, Dr. C. H. Shattuck, of Washburn College, has been appointed to the chair of botany and forestry.

Tennessee University and Station.—The 1908 session of the Summer School of the South, held at the university June 15 to July 25, was extremely successful. About two thousand students, mostly teachers from Tennessee and other southern States, were enrolled. About 125 elected the agricultural work in which for the first time courses were arranged sufficient to occupy the whole time of the students. These courses were conducted throughout the session and included plant life, horticulture, animal life, animal husbandry, and agricultural education, election of four of these courses being required.

J. N. Price has resigned as dairyman and has been succeeded by F. H. Dennis. James Tyler has resigned as poultryman in the station.

Texas College and Station.—R. T. Milner, State commissioner of agriculture, has been elected president of the college to succeed H. H. Harrington, who will devote his entire attention to the directorship of the station. E. R. Kone of San Marcos has been appointed to the commissionership of agriculture, thereby becoming an ex-officio member of the board of directors. It is expected that the next legislature will establish a number of additional substations.

Virginia College and Station.—Dr. W. J. Quick has resigned as dean of the agricultural department in the college, retaining his work in animal husbandry, and has been succeeded as dean by H. L. Price, the horticulturist. Dr. Howard S. Reed of the Bureau of Soils of this Department, has assumed the duties of plant pathologist in the college and station vice Dr. Meade Ferguson, who has accepted the position of bacteriologist to the State board of health. W. D. Saunders has been appointed State dairy and food commissioner. He will retain the superintendency of the college creamery, but will be succeeded as professor of dairying in the college and dairyman in the station by W. K. Brainerd, formerly of the West Virginia University. W. L. Mallory, a 1908 graduate of the college, has been appointed assistant in animal husbandry and agronomy for work on Adams fund projects.

Washington College and Station.—Dr. H. B. Humphrey, recently connected with Leland Stanford Jr. University, has been appointed assistant professor of botany in the college and assistant botanist in the station, assuming these duties September 1. G. A. Olson, of the Wisconsin University and Station, has been appointed assistant chemist in the station, vice H. R. Watkins, whose resignation has been previously noted. W. H. Lawrence, superintendent of the Puyallup Substation, has been appointed plant pathologist in the station and will devote a considerable portion of his time to studies of plant diseases in western Washington. E. E. Elliott has resigned as agriculturist to become dean of agriculture in the University of Idaho. C. H. Goetz, a postgraduate student at the University of Michigan, has been appointed instructor in forestry.

Wyoming University and Station.—T. F. McConnell has resigned as animal husbandman to engage in commercial work and has been succeeded by A. D.

Faville of Wisconsin. Dr. O. L. Prien has assumed the duties of instructor in veterinary science in the university and veterinarian in the station. H. T. Nowell has resigned as irrigation engineer and has been succeeded by J. C. Fitterer.

Prospective Meetings of Agricultural Workers in Washington.—Arrangements have been completed whereby a number of organizations of agricultural workers will hold meetings in Washington in November. The Association of Official Agricultural Chemists will be in session from November 12–16, the Society for the Promotion of Agricultural Science on November 16, the American Association of Farmers' Institute Workers on November 16 and 17, and the Association of American Agricultural Colleges and Experiment Stations from November 17–19.

National Corn Exposition.—The second National Corn Exposition will be held at Omaha in December. As a special feature extensive educational exhibits by a number of agricultural colleges and experiment stations are contemplated, these to be of such a character as to give visitors an idea of the work carried on by these institutions.

Commission on Rural Life.—A commission has been appointed by President Roosevelt to make recommendations touching the betterment of the social, sanitary, and economic conditions of American farm life. Dean L. H. Bailey, of Cornell University, has accepted the chairmanship of the commission, the remaining members of which consist of Henry Wallace, editor of *Wallace's Farmer*, President K. L. Butterfield of the Massachusetts Agricultural College, Gifford Pinchot of the Forest Service of this Department, and Walter H. Page, editor of *World's Work*.

Agricultural High Schools in Oklahoma.—In accordance with the law passed by the first State legislature of Oklahoma providing for the establishment and maintenance of agricultural schools of secondary grade in each supreme court district of the State, 2 schools have been established this year, one known as the Murray State School of Agriculture, located at Tishomingo in Johnston County and the other at Warner in Muskogee County. These State schools will offer no courses of instruction other than industrial courses. Each school has an appropriation for the first year of $20,000 for buildings and $12,000 for maintenance. One-fourth of the maintenance fund for each school must be expended in developing agricultural experiments in the field, barn, orchard, shop, and garden. The Tishomingo School has 120 acres of land and the Warner School, 160 acres.

These and the other similar schools in the State will be under the supervision of the State Commission of Agricultural and Industrial Education, which consists of the State superintendent of public instruction, E. D. Cameron, the president of the State Board of Agriculture, J. P. Connors, and the president of the Agricultural and Mechanical College, J. H. Connell. The Murray School will open this fall and will be in session 8 months.

Smith's Agricultural School.—Plans have been adopted for the main building of this school, which is to be opened during the fall. A two-story red brick structure, with limestone trimmings, 200 by 69 ft., is contemplated, comprising offices and administration rooms, an auditorium, an arena for athletic sports, physical and chemical laboratories, class rooms, etc.

Farmers' Summer School for Negroes.—Clark University, Atlanta, Ga., held from August 3 to 8, a well-attended farmers' summer school especially for the education of the negroes. The instruction consisted of lectures by agricultural experts in the South on the following topics: Farm Garden and Orchards, The Plow—its Care and Adjustment, Fall and Winter Plowing, The Best System of Renting Farm Lands, Management of Farm Labor, Selection of Seed Cotton

and Seed Corn for Planting, Care of the Dairy Herd, Improvement of the Cotton Plant, How to Extend the Rural School Term, Harvesting Corn and Cotton, How to Keep Boys on the Farm, Keeping the Farm Neat and Attractive, Poultry Raising, Insects Injurious to Farm Crops, etc.

Agricultural Education.—The Iowa State Fair and Exposition offered prizes amounting to $500 to the boys and girls of Iowa taking part in contests at the fair August 22. The boys competed for first, second, and third prizes of $200, $100, and $25, respectively, in a corn-judging contest, and the girls for prizes of $100, $50, and $25 for preparing food products and giving reasons for their methods of work.

Prof. W. C. Palmer, who has been at the head of the department of agriculture of the Winona Agricultural Institute, Winona Lake, Ind., has been made dean. He is enlarging the work of the Institute by the addition of new courses and new members to the faculty. The practical 2-year course is being improved, and an advanced 4-year course leading to a degree and a normal course have been added. The courses are modeled after that of the Minnesota School of Agriculture.

According to *Journal d'Agriculture Tropicale* of April 30, 1908, there has been established at Havre, France, by a number of merchants and members of the cotton association of that city a Practical Colonial School, which is designed as a training school for artisans and others in the agricultural, industrial, and commercial exploitation of the French colonies. Lecturers have been chosen from among specialists in colonial affairs who will give instruction in different cultures, particularly that of cotton, and in colonial hygiene and other affairs pertaining to tropical countries. It is expected that about three years will be required for the proper coordination of the different departments of the institution. At present it consists of a collection of cotton ginning and compressing machines of different types, a conference hall, a library of colonial publications, and a colonial museum.

Miscellaneous.—Dr. H. D. House, formerly of the Clemson College and Station, has been appointed associate director in the Biltmore Forest School.

H. H. Cousins has been appointed director of agriculture and island chemist in Jamaica, vice William Fawcett, resigned.

A new fellowship, the Monro Fellowship, has been established at Cambridge, to which T. B. Wood, Drapers' professor of agriculture, has been elected.

W. W. Rawson, prominent as seedsman, market gardener, and writer on horticultural topics, died August 9, at Arlington, Mass., at the age of 61 years.

H. D. Everett, superintendent of the division of forest administration of the Philippine Bureau of Forestry, was murdered by natives in the island of Negros during the early summer. He was 28 years of age.

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EXPERIMENT STATION RECORD.

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Assistant Editor: H. L. KNIGHT.

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CONTENTS OF VOL. XX, NO. 2.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Continued.

U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

VOL. XX. OCTOBER, 1908. No. 2.

With the expansion of experimental inquiries in agriculture in the United States there is growing interest in investigations dealing with the special needs of particular regions. This is leading to appropriations by State legislatures for substations. To be most effective these substations should be organized to work on definite problems indicated by their local environment. This is especially true in regions where the natural conditions require that agriculture must have a peculiar organization to be successful. This may be illustrated by the conditions existing in the regions in this country where irrigation or drainage is a fundamental requisite of agriculture.

As an example of the organization of experiment stations with reference to peculiar regional conditions, the work being done by the German Government with a view to the reclamation of moor lands is interesting, since it shows a well-directed specialization of experimental inquiries. The attention of our readers is therefore called to some observations on the moor experiment stations of Germany made by Mr. C. G. Elliott, chief of Drainage Investigations of this Office, as the result of a recent visit to these institutions in connection with a study of drainage conditions in Europe.

The moor lands of Germany have long been celebrated in poet's song and upon painted canvas, yet in their natural state they are worthless for growing food plants, a barrier to travel between different sections of the Empire, and forbidding to the prospective home maker. There are more than 5,000,000 acres of these lands, most of them in Government ownership, which yield no revenue and support but few people. Existing as they do in this land of intensive cultivation, and in full view of people of acknowledged industry and scientific attainments, it is a matter of surprise that no greater progress has been made in utilizing them. As an inducement to their settlement, the Government at one time offered immunity from military service to such as would make homes upon the Government moors. Notwithstanding the efforts so far made to reclaim and utilize this vast area of waste land, only about 15,000 acres have been converted into productive fields.

The upland moors are covered with the *Calluna vulgaris*, ordinarily called heather, which, when in bloom, has the appearance of red clover. The plant is an evergreen shrub, growing about a foot high, with foliage like our juniper or red cedar. Scattering birch trees and a few deciduous shrubs, in addition to the attractive bloom of the heather, make a pleasing scene and one which well merits the notice of the artist. The moors are immense beds of decayed mosses, among which the sphagnum genus largely predominates, and are from 6 to 15 feet deep. Underneath them, in some localities, is a stratum of sand, in others clay, and in still others lime rock. The several layers, which are easily traced when a section of the bed is made, indicate that different cycles of climatic conditions have attended the formation of this huge vegetable sponge. The entire mass is filled with water, and is impassable for large animals and nearly so for men. The more solid parts are dug out in brick form, dried in the open air, and used for fuel. The top 4 feet in depth, in many of the moors in northern Germany, is too light and spongy for fuel. When dry this is passed through a machine with two rollers carrying hooks which pull the material to pieces, after which it is baled and shipped abroad to be used as bedding for live stock in barns in the place of straw, and for the manufacture of mattresses, and for other similar purposes.

Some progress in utilizing this land for agriculture has been made in the more favorable localities by individuals, who have shown enterprise and untiring industry. The lands lying in the valley of the Salzach River, near Salzburg, Austria, have been highly productive many years. These moors lie upon limestone, differing in that respect from those in northern Germany. Grasses grow exceedingly thick upon this soil, three good crops being gathered each season. Here fruits are grown to some extent, as well as all the cereal crops. The drainage is accomplished by open ditches, often as deep as 7 feet, placed parallel to each other about 70 feet apart. No lime is required in preparing the raw land for crops, but annual dressings of fertilizers containing potash and phosphoric acid, supplemented by barnyard manure, are a necessary part of their management.

In late years the Government has established experiment stations, having for their sole object the reclamation of moor lands. Notable among them are those at Hude and Ottersberg, in northern Germany, under the direction of Dr. Tacke; in the south, the principal one of which is at Bernau, under the direction of Dr. Baumann; and those in the interior, under the direction of Dr. Schrieber.

A cursory view of some portions of the moors which have been reclaimed in the vicinity of Hude reveals a most unique kind of agriculture. The highway, bordered by birch trees, is built upon the original surface of the land, while upon either side, and 8 feet below, are little meadows of grass, or fields of potatoes growing upon terraces

arranged at various heights, which have been formed in the process of removing the peat for commercial purposes. Large ditches, affording outlets for the drainage of the moors, have been excavated to the layer of sand, and lead directly to the river. It has been learned that any part of the turf can be removed and the place from which it was taken, when drained and treated with suitable fertilizer, can be made productive, that part lying 8 feet below the surface and near the sand base being as valuable as the original surface. The spongy and soft nature of the land requires special methods of management. The field lanes, as well as the public roads, must be well covered with sand to prevent the wheels of vehicles from sinking too deeply into the muck. The horses must have broad footpads clamped to their hoofs whenever they are driven upon the fields. A large part of the cultivation and preparation of the soil for the crops must be performed by hand labor. The farm buildings settle unevenly and soon present a sorry appearance unless their foundations are sunk to the underlying sand or clay.

As a sequence of the experimental work at the Government moor culture stations a great impetus has been given to the development of these lands, which for centuries have lain idle. The results obtained in the several parts of the Empire, and the assistance given to moor farmers, have imparted a confidence in the future of these lands which bids fair to gradually bring them into the agricultural domain. Particular value attaches to the work of the station at Bernau, in Bavaria, bordering the Chiem See, at the foot of the Tyrol Mountains, where 5,000 acres of moor land lies in sight of the King's castle, a mile distant, since it has brought into prominent notice some of the essentials of successful moor culture.

As may be readily inferred, the first step in reclaiming these moor lands is drainage. The land is virtually a bog with water lying at the surface, and held throughout most tenaciously by the vegetable spongy material of which the moor is composed. The usual practice among farmers is to dig ditches 2 feet deep and 45 feet apart, dividing the land into narrow strips which must always thereafter be cultivated as separate fields. The station has shown that the ditches may be made 65 feet apart and 3 feet 8 inches deep, in which drain tile may be placed after the ditches have lain open for two or three months. The ditches are then filled and level culture is practiced, resulting in great economy of labor and in the saving of about one-fortieth of the surface of the land, which in the ordinary method of draining would be occupied by open ditches. It was formerly held by those well versed in moor culture that drain tiles would not remain in alignment because of the continual settling of the land which follows the removal of the water and subsequent cultivation. A careful record of the position of the water table of the drained moors shows

that the earth is always saturated at the level of the drains and that the settling of the earth is limited to that portion which lies above them. Clay tiles 2 inches in diameter are used for all laterals, which are usually planned so as to be not more than 800 feet long. A successful method of measuring the volume of flow from the drains and of determining the position of the water table of the soil between them, and representing it above ground to the eye, has been put in operation at the station. The growing season in this locality is short and the winter long and severe, so that one summer season is required to effect the drainage of the land. Hand labor must be relied upon in all the construction, and also largely in removing the native vegetation previous to seeding the ground.

The proper control of the water content of the soil is considered essential. At the Bernau station good drainage is secured and sufficient moisture conserved by drains placed 3 feet 4 inches to 3 feet 8 inches deep. Rains occur almost every week. The climate is cool, so that evaporation from the land is small. In northern Germany, however, where the strata underlying the turf are sand, somewhat facilitating the natural drainage, stops are sometimes placed in the outlet ditches for the purpose of holding the water within 2 feet of the surface. A considerable portion of this turf is of a less compact character than that previously described. In general a depth of 1 meter (or 39 inches) and lines laid 20 meters (or 65 feet) apart are found to give the best results in moor land.

The cost of draining, even with labor as cheap as it is in that country, is about $35 an acre, and the cost of preparing the land for the first crop is $10 more, making the expense of draining and preparing land for the first crop about $45 an acre. Before improvement the land has a value of about $20 an acre, but after being reclaimed and prepared for the production of crops it is worth $200 an acre. It is reported at Bernau that the produce of the drained land nets $13 per acre annually.

The director of the Bernau station has made the following offer to owners of moor land adjoining the station farm: The Government will drain the land and turn it over to the owners at the end of three years, well seeded to grass, asking only the use of the land during that period and $8 an acre additional to be paid by the owner at the time the land is returned. Thus the owner will give $8 an acre and the use of the land for three years for the reclamation of his moor. This shows the financial side of the question quite clearly and indicates that the owners of these lands may safely undertake their reclamation.

Drainage, though the first essential, is by no means the only requirement of these lands. Those having a sandy substratum require a liberal treatment of lime and also of fertilizers containing potash and phosphoric acid to fit them for producing the first crop. The

latter fertilizers must be applied to the land regularly each year, incurring an annual cost of from $3.50 to $4 an acre.

Another result of these developments is that the speculative value of moor lands has advanced quite materially in nearly all localities. With good drainage the lands may be grazed profitably, though some care is required to keep intact the surface of those portions used for pasture. Meadow grasses, clover, oats, rye, potatoes, beets, and other root crops are grown successfully in the fields, and flowers and vegetables in the garden. It may be said, however, that much remains to be learned regarding the proper fertilization of the land for the economic production of staple crops. The Government is prosecuting this part of the investigation with great care and has attained a reasonable measure of success.

Turning to the moor lands of America, it may be remarked that they are quite different from those in Germany in several important particulars. They are not usually as deep as 16 feet, and many of them have their origin in decayed sedges and grasses, the resulting turf resting upon clay or upon sand only 4 or 5 feet below the surface. The sphagnum moss lands in the north are less compact than the German lands of that class, being apparently of more recent geological formation than those of Europe. Their characteristics, as far as drainage and natural fertility are concerned, are not far different, judging from the few results so far attained in this country. The work on German moors has demonstrated the practicability of making them profitably productive under conditions which exist there, namely, cheap labor, all arable land occupied, and a constant demand for staple crops at good prices. We are approaching these conditions in America, but are still quite distant from such as prevail in Germany. We are beginning, however, to look into the possibilities of our own moor lands. That they are less promising for agriculture than the alluvial swamp and wild lands which we are accustomed to reclaim is acknowledged, yet considering the attention which is now being directed to that portion of our domain, they merit careful examination and experimental treatment.

The acquisition by this country of Hawaii, Porto Rico, and the Philippines has brought to the American people a number of agricultural problems that are pressing for solution. In the past these countries have produced in important amount but one or at most a few crops. In Hawaii sugar, in Porto Rico sugar and coffee, and in the Philippines tobacco and Manila hemp have been the most important agricultural products. Many minor crops are grown, but of as important a crop as rice not enough is produced to meet the requirements and large quantities must be regularly imported.

This is a direct result of the system of agriculture that has been developed in those countries, that of the large holder, either an

individual or a corporation, who employs a large number of peon or contract laborers. In most instances the estate is under the direction of a manager, whose desire is to secure a maximum yield with a minimum outlay. In many cases this has resulted in the continuance of antiquated methods and finally in the utter impoverishment of the soil. There have been some exceptions to this rule, notably in Hawaii, where the methods followed on some of the sugar plantations can be cited as models for the tropical world.

Since these insular regions have become a part of the United States, efforts have been made to develop their agriculture upon more rational lines. In 1901 agricultural experiment stations were established under the direction of the Office of Experiment Stations in Hawaii and in Porto Rico, and a system of agricultural stations is provided for by the local Government in the Philippines. Congress at its last session made an appropriation for the establishment of a station in Guam, and some preliminary work has already been begun on that island. At all of these stations the fundamental idea has been the diversification of agriculture. The single-crop system has in the past been a highly remunerative one to the employer, but it has not contributed very much to the general welfare of the community. It tends to centralization of wealth and power, and the individual ceases to be much of a factor in the economic development of the country as a whole. At all of the experiment stations attempts are being made not only to improve the present agricultural practices, but to introduce new crops and industries. In doing this it is believed that not only will the producing capacity of the countries be increased, but that many small holdings will be developed and made profitable and the islands filled with a more enlightened and contented population.

In the establishment of these stations and the introduction of new crops and improved methods of cultivation, many unexpected difficulties have arisen. In the first place, it has been very difficult to secure and retain qualified men in these new and in many ways strange lands. Naturally the agricultural and other institutions on the mainland were drawn upon to supply the personnel of the new stations, but none of our institutions have courses that are especially adapted to the needs of an investigator in the Tropics. The best that can be done under the circumstances is to get men with good general training along the lines of their various specialties, and allow them sufficient time to become adjusted to their new surroundings. Conditions of living, methods of agricultural practice, kinds of crops, etc., are so at variance with those upon the mainland that some time is required to adapt the old theories to new and unfamiliar conditions.

Under the influence of tropical climates, many factors are wanting that are common in temperate zones. The influence of frost, prolonged hibernation, resting periods, etc., are absent, and in their stead

we find continual growing periods, varied by more or less pronounced dry and rainy seasons. Soils do not react as is often taught, fertilizer requirements vary, insect and fungus pests never cease their depredations, weeds are a greater pest than in temperate climates where annuals are limited in the number of generations within a season and where frost checks for a time the growth of perennials, many and often strange diseases affect farm animals—all these go to perplex the investigator in the Tropics.

Many persons going into tropical regions have made the mistake of attempting radical changes in the methods of agricultural practice. Often the methods in vogue are the result of centuries of unconscious experimentation on the part of the agriculturists. Some things that appear very simple and easy of demonstration fail when put to the test. As an example, it was thought desirable to get away from the oriental method of rice growing that involves so much hand labor in transplanting the crop, and to substitute machinery by which the seed grain was drilled where the crop was to grow. Experiments carried on in Hawaii and in the Philippines have shown that under the existing conditions the oriental method gives the best results. Not only were larger yields secured from transplanted rice, but the cost of production was decidedly less when the added labor of draining the fields, extra amount of seed, cost of machinery, etc., were considered.

A rather discouraging feature of the work in the Tropics is the slowness with which demonstrated results are taken up and applied. For the most part the constituency of the stations are unappreciative and conservative in the extreme. New crops and unusual methods appeal to but a very few individuals, hence the progress noted is not rapid. But, for the time they have been established, the stations have more than met the expectations of those fully acquainted with their organization, aims, and resources, and they have about completed their period of pioneering and are entering upon an era of great usefulness.

Congress at its last session appropriated $5,000 for the establishment of an agricultural experiment station on the Island of Guam. During the past summer Dr. W. H. Evans of this Office visited the island and made preliminary arrangements for opening the station and starting experimental work on the improvement of the agriculture as now practiced.

The Island of Guam is a fertile island of nearly 300 square miles, situated 1,200 miles east of the Philippine Islands, and was acquired as a naval and cable station. Formerly most of the 10,000 or 12,000 people inhabiting the island were engaged in agricultural pursuits. For various reasons, some of which were economic, others agricultural, many cultivators left their plantations and accepted other

employment, until now there is not sufficient food produced to properly sustain the inhabitants. Rice and other foodstuffs are imported from Japan. The internal development work can not be continued on the same scale as formerly, and something must be done to get the people back to their farms. Attempts will be made to introduce new methods of cultivation, new varieties of standard tropical crops, and improved live stock, and to take up breeding and selection in connection with plants and animals. As rapidly as promising material is secured in quantity, the surplus will be distributed for the benefit of the farmers.

While the island is volcanic in origin, the hills are low, none of them exceeding 1,500 feet in elevation, and at least 65 per cent of the land is believed to be capable of cultivation. The remainder is nearly all forested with valuable timber or could be reforested at comparatively little expense. The rainfall of the island averages nearly 100 inches per annum, and while most of it falls during July to November, the so-called rainy season, there are sufficient showers during the other months to permit of crop growing without irrigation. There are now some attempts at growing corn, rice, coffee, cacao, and sugar cane, with extensive plantings of bananas, cocoanut, and breadfruit trees. In a smaller way, some beans, tobacco, sweet potatoes, yams, etc., are grown and it is with these crops that the first work will be done. Considerable introductory work had already been carried on in cooperation with the Hawaii Station, and this will be continued until the best of the agricultural and horticultural products of that Territory are represented in Guam.

There appears to be a woeful lack of cultivated grasses and of pastures, except in the savannas, which are covered with coarse grass that is not palatable to stock except for a short time. Already some of the varieties of grass that have proved especially adapted to the tropical regions of Hawaii and the Philippines have been sent to Guam, and others will be added as fast as possible. The introduction of leguminous plants in cropping will undoubtedly prove of benefit not only for the forage they will produce, but for their renovating power upon lands that have become impoverished by a long-continued cropping without adequate preparation of the soil.

For several years a pest of the cocoanut trees seemed to threaten the most important industry of the island. It is a kind of mealy bug that attacks the young plants within the leaf sheath, and when present in great numbers often destroys the plant. This was thought to be one of the first problems needing attention, but there appears to be evidence that it is not gaining in importance and that either through parasitism or some other cause its threatened invasion is at least temporarily checked. However, studies have been begun upon the insect, and should it again appear in abundance means for its control will probably be at hand.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Joint recommendations of the physiological and biochemical committees on protein nomenclature (*Science, n. ser., 27 (1908), No. 692, pp. 554–556*).—The recommendations adopted are (1) that the word "proteid" be abandoned; (2) that the word "protein" shall be used to designate "that group of substances which consists, so far as at present is known, essentially of combinations of α-amino acids and their derivatives, e. g., α-aminoacetic acid or glycocoll; α-amino propionic acid or alanin; phenyl-α-amino propionic acid or phenylalanin; guanidin-amino valerianic acid or arginin, etc., and are therefore essentially polypeptids;" and (3) that the following terms be used to designate the various groups of proteins: Simple proteins—that is, protein substances which yield only α-amino acids or their derivatives on hydrolysis; conjugated proteins—that is, substances which contain the protein molecule united to some other molecule or molecules otherwise than as a salt; and derived proteins.

The simple proteins would include albumins, globulins, glutelins, alcohol-soluble proteins, albuminoids, histones, and protamins. The conjugated proteins would include nucleoproteins, glycoproteins, phosphoproteins, hemoglobins, and lecithoproteins. The derived proteins would include primary protein derivatives and secondary protein derivatives. In the former group proteans, metaproteins, and coagulated proteins are included and in the latter proteoses, peptones, and peptids.

A suggestion for a new unit of energy, H. P. Armsby (*Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 164–167*).—The author's proposition for a new unit of energy has been noted from another publication (E. S. R., 19, p. 704).

A supposedly new compound from wheat oil, R. A. Gortner (*Jour. Amer. Chem. Soc., 30 (1908), No. 4, p. 617*).—From wheat oil the author obtained crystals which on recrystallization showed a melting point of 96.5°. The compound, he states, contained nitrogen, but the work was discontinued before its character was determined.

Physical and chemical properties of the fat of the common chestnut, R. Paladino (*Rend. Accad. Sci. Fis. e Mat. Napoli, 3. ser., 13 (1907), pp. 89–93; abs. in Jour. Chem. Soc. [London], 92 (1907), No. 541, II, p. 905*).—Chestnut fat was found to consist of an oily and a solid portion and the physical and other characteristics of the two sorts of fat were studied.

The rotatory power of alcoholic extracts of cereal proteids, Lindet and L. Ammann (*Ann. Inst. Nat. Agron., 2. ser., 6 (1907), No. 2, pp. 233–242*).—The specific rotatory power of proteids from wheat, barley, rye, and maize was measured. According to the author, this property of cereal proteids varies with the concentration of the alcoholic extract. See also a previous note (E. S. R., 19, p. 808).

The relation between refraction and iodin value in pork fat and the non-volatile fatty acids insoluble in water, G. Halfpaap (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 2, pp. 65–72*).—Variations in the iodin value

of fats with the same index of refraction, according to the author's investigations, are due to an abnormally high refraction value. This value is not dependent upon free oxy-acids but is due, the author considers, either to polymerization—that is, lactone formation—or, very probably, to the conversion of normal oleic acid radicals into iso-oleic acid.

Preparing odorless fatty acids from fish oil, A. SANDBERG (*Corps Gras Indus., 32 (1906), pp. 355, 356; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 4, pp. 244, 245*).—In the method described crude fatty acids from fish oil are treated with 20 per cent sulphuric acid at 25 to 40°, being stirred constantly, then allowed to remain for a few hours, washed with water, and distilled. Thus purified the fatty acids solidify at 25 to 36°. According to the author, the disagreeable odor of fish oil depends upon the presence of proteid cleavage products. The purified oil, it is stated, has many technical uses.

Hydrolyzing and oxidizing bacteria of fat, E. DE KRUYFF (*Bul. Dépt. Agr. Indes Néerland., 1907, No. 9, pp. 13, pls. 2*).—Bacteria which induce hydrolysis and oxidation in fat are studied and described and the amount of decomposition which they induce measured.

Contribution to the study of the composition of starch grains, Mme. Z. GATIN-GRUZEWSKA (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 4, pp. 178, 179*).—According to the author's conclusions, amylose constitutes the soluble material in the starch grain and amylopectin the envelope of the starch grain.

Concerning the composition of the starch grain, Mme. Z. GATIN-GRUZEWSKA (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 10, pp. 540–545*).—A contribution to the structure and composition of the starch grain followed by a note by L. Maquenne.

Note on vegetable phosphatids, II, E. WINTERSTEIN and O. HIESTAND (*Ztschr. Physiol. Chem., 54 (1908), No. 4, pp. 288–330*).—Cereals, lupines, vetch, and potatoes were among the materials included in this investigation.

According to the author, different vegetable products contain substances extractable with alcohol and ether which yield carbohydrates on cleavage with acid and for which the name "phosphatid" is proposed. The material obtained from *Pinus cembra* seed, however, was an exception and did not contain carbohydrate. The amount of reducing substance obtained varied greatly in the case of different materials, the phosphatid of a sample of *Triticum vulgare* yielding 16 per cent and a sample from *Lupinus albus* 13 per cent, while only 1 per cent was obtained from material extracted from *L. luteus*.

From the cereal phosphatid pure galactose was obtained and the presence of δ-glucose demonstrated. As yet it is not possible to determine whether these hexoses are present as such or as disaccharids or polysaccharids.

From experimental evidence, the conclusion seems warranted that the phosphatids of wheat contain other nitrogenous components in addition to cholin and it is not impossible that they also contain unknown nitrogen-free material.

Observations on the formation of aldehyde or ketone in acetic fermentation, K. FARNSTEINER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 6, pp. 321–326*).—A study of the volatile reducing bodies of vinegar.

The action of anilin colors on diastase and pepsin, S. SATO (*Jour. Jap. Pharm. Soc., 1907; Pharm. Ztg., 52 (1907), p. 1022; abs. in Jour. Pharm. et Chim., 6. ser., 27 (1908), No. 5, p. 246*).—The anilin colors studied stopped the action of diastase and pepsin.

Coloring matter in apple juice, P. KULISCH (*Ber. Landw. Vers. Stat. Colmar, 1904–1906, pp. 79, 80; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 2, p. 104*).—According to the author, natural apple juice regularly contains a yellow coloring matter which dyes woolen well. The bearing of this fact

upon the analysis of lemonade goods containing apple juice is discussed with special reference to the detection of added coloring matter.

The determination of carbon, I. Pouget and D. Chouchak (*Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 2, pp. 75–80; abs. in Chem. Abs., 2 (1908), No. 8, p. 1105; Analyst, 33 (1908), No. 385, p. 142*).—In the method described carbon is determined in soils by combustion with lead chromate and potassium bichromate, the carbon dioxid and nitrogen evolved being collected in a gas holder over mercury upon which floats a measured quantity of one hundredth-normal barium hydrate, the barium hydrate being finally titrated with one hundredth-normal sulphuric acid.

Determination of phosphoric acid, W. Pawlenko (*Vyestnik Sakh. Promuish., 1906, No. 37, p. 417; abs. in Centbl. Zuckerindus., 16 (1908), No. 21, p. 582*).—Comparative tests are reported which indicate that alkaline magnesia mixture gives as accurate results as the neutral mixture recommended by Järvinen.

Alkalimetric estimation of phosphoric acid by Neumann's method, J. P. Gregersen (*Ztschr. Physiol. Chem., 53 (1907), No. 6, pp. 453–463; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 543, II, p. 64; Ztschr. Angew. Chem., 21 (1908), No. 11, p. 498*).—As a result of his investigations the author prescribes the following precautions as necessary to the best results with the Neumann method: In the destruction of the organic matter and the incineration of the material use 20 cc. of Neumann's acid mixture, adding from time to time during the process small amounts of concentrated nitric acid instead of the mixed acids. In precipitation use 250 cc. of liquid containing 15 per cent of ammonium nitrate, heat to 70 to 80° C., and add a slight excess of 10 per cent ammonium molybdate. In the final titration add a slight excess of standard acid, boil to remove carbon dioxid, and titrate back with one-half normal sodium hydroxid.

Determination of free sulphuric acid in superphosphates, A. Pomaski (*Vyestnik Sakh. Promuish., 1907, No. 50, p. 765; abs. in Centbl. Zuckerindus., 16 (1908), No. 20, p. 552*).—The method is in brief as follows: Shake 30 to 50 gm. of a finely ground superphosphate with 150 cc. of water-free ethyl alcohol for 15 to 20 minutes at room temperature with exclusion of air. Neutralize an aliquot of the solution thus obtained with sodium hydroxid and evaporate to dryness. Take up the residue in a little water, strongly acidify with hydrochloric acid, and determine sulphuric acid with barium chlorid in the usual way.

Industrialization of analysis. Methods and apparatus used in the determination of nitrogen and phosphoric acid in fertilizers, H. Rousset (*Rev. Gén. Chim., 10 (1907), No. 6, pp. 105–113; abs. in Chem. Abs., 1 (1907), No. 12, p. 1601*).—It is stated that the industrial chemist is as a rule interested mainly in matters of routine and desires chiefly knowledge of apparatus and methods. This article gives a general account of apparatus and methods used at the Aisne agricultural station in a large number of routine determinations of nitrogen and phosphoric acid in fertilizers.

On the determination of hardness, as well as free, partly combined, and combined carbon dioxid in waters, H. Noll (*Ztschr. Angew. Chem., 21 (1908), No. 14, pp. 640, 641; abs. in Chem. Abs., 2 (1908), No. 14, p. 1942*).—A comparison is reported of Lunge's method of determining combined carbon dioxid in water by titrating with hydrochloric acid in the cold, using methyl orange as an indicator, with the method in which a given volume of water is boiled with a measured amount of standard sulphuric acid and the carbon dioxid calculated from the amount of unused sulphuric acid. The Lunge method was found to give accurate results for the combined carbon dioxid, while the other method gave results nearly a third too low.

Practical treatise on the analysis of foods, E. Gérard and A. Bonn (*Traité Pratique d'Analyse des Denrées Alimentaires. Paris, 1908, pp. 604, figs. 42; rev. in Brit. Med. Jour., 1908, No. 2458, p. 327*).—Though this handbook of food inspection has been prepared with special reference to the requirements of French analysts, it contains data which will prove useful in other countries. Each chapter concludes with extracts from laws and government regulations regarding the purity of foods dealt with, etc., and French official analytical methods are given in the appendix.

Analytical methods and miscellaneous communications regarding food materials, etc. (*Rev. Internat. Falsif., 21 (1908), No. 1, pp. 4–24, fig. 1*).—A number of papers including among others the following: Vinegar and the Law, by L. Mathieu; Montpellier Milk Standards, by Bertin-Sans, Defrance, and H. Imbert; A Simple Method for Determining Raw and Cooked Milk, by L. Gaucher; and the Dangers of Employing Arsenious Insecticides in Agriculture from the Standpoint of Public Hygiene, by P. Cazeneuve.

Micrographical examination of meat powder, C. N. Peltrisot (*Bul. Sci. Pharmacol., 14 (1907), pp. 19–33; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 4, p. 238*).—Methods of judging of the character and quality of meat powder are described which involve the use of the microscope and various stains.

The estimation of boric acid in liquid eggs, A. E. Parkes (*Brit. Food Jour., 10 (1908), No. 110, pp. 20, 21*).—According to the author, the usual methods employed for the estimation of boric acid were not altogether satisfactory when applied to liquid eggs, and better results may be obtained if protein is first precipitated with alcohol, tannin, or mercurous nitrate, of which the last mentioned is preferable.

The presence of boric acid may then be qualitatively determined by testing with sulphurous acid and turmeric paper. Boric acid is estimated quantitatively with standard sodium hydrate in the presence of phenolphthalein after the separation of protein and phosphates.

The author quotes the results obtained by his method in comparison with other methods and when known quantities of boric acid were used.

The Burstert method of determining fat in cheese, E. Mühlbach (*Milchw. Zentbl., 4 (1908), No. 5, pp. 193–237, figs. 2*).—According to this method cheese is dissolved in an acid solution and the fat is separated centrifugally. The proportion of fat is indicated by the divisions of the scale on the neck of the special bottle used.

Method for the complete analysis of vegetable products, J. M. Albahary (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 7, pp. 336–338*).—The scheme for proximate analysis of vegetable products which the author outlines is more detailed than that usually followed in food analysis, chiefly owing to the determination of a number of the individual constituents making up the nitrogen-free extract group.

The estimation of starch in maize, A. Frank-Kamenetzky (*Chem. Ztg., 32 (1908), Nos. 14, pp. 157–159; 15, pp. 175, 176*).—According to the author, the starch value of maize bears a direct relation to the amount of extract when the latter factor is determined under controlled conditions. In the method which he outlines, a sample of finely ground meal is inverted with diastase, high pressure being avoided, properly diluted, filtered, and the amount of extract material determined with an immersion refractometer or by determining the specific gravity with a pycnometer. The method of calculating the results, the corrections which must be introduced, and similar topics are discussed and the results of a number of determinations reported. The author believes that his method is applicable to other sorts of grain as well as to maize.

Official analysis of Russian high-grade sugars (*Sugar Beet, 29 (1908), No. 4, pp. 320, 321*).—Changes in the method of analysis of standard white sugars adopted by the Imperial Technical Committee in Russia are summarized.

Concerning the Marpmann reaction for distinguishing between separator honey and honey obtained by heating the comb, Utz (*Ztschr. Öffentl. Chem., 14 (1908), No. 2, pp. 21–28*).—The reaction under consideration depends upon the detection of the ferment present in raw honey which is destroyed when it is heated over 50°. Hydrogen peroxid is used as a reagent and *p*-phenylendiamin or other material as an indicator. Methods of manipulation and related topics are discussed and the results of an examination of a large number of samples of German and foreign honeys are reported.

The detection of cherry juice in raspberry juice, Jonscher (*Ztschr. Öffentl. Chem., 14 (1908), No. 2, pp. 29, 30*).—The author criticises the lead-acetate method for the detection of cherry juice, particularly in the case of raspberry juice which has undergone fermentation, and states that he proposes to study this question.

Examination of white wine colored with parched chicory, Popescu (*Ann. Chim. Analyt., 13 (1908), No. 3, p. 101*).—According to the author's investigations, parched chicory coloring matter is insoluble in ether but is extracted by amyl alcohol, which is not the case with the coloring matter of the untreated white wine. Fresh albumin completely precipitates the natural coloring matter of wine, the filtrate being uncolored with natural wine and yellow if chicory has been used. Other characteristic differences are also pointed out.

Ester estimation in wine, G. Austerweil and P. Pacottet (*Chem. Ztg., 32 (1908), No. 10, pp. 112, 113, fig. 1*).—Apparatus is described which, according to the author, facilitates the determination of esters in wines.

Lactic acid in wine, G. Paris (*Staz. Sper. Agr. Ital., 40 (1907), No. 8–12, pp. 689–720, figs. 3*).—A comparison of the author's method with other methods for estimating lactic acid in wine.

The precipitation method for the estimation of oils in flavoring extracts and pharmaceutical preparations, C. D. Howard (*Jour. Amer. Chem. Soc., 30 (1908), No. 4, pp. 608–611*).—The precipitation method, according to the author, affords a direct and valuable check on polarimetric results in addition to providing the material for a refractometric examination. The results which he presents were obtained with solutions of different strength and also with commercial extracts.

The quantitative estimation of total sulphur in urine, H. Schulz (*Arch. Physiol. [Pflüger], 121 (1907), No. 1–2, pp. 114–116*).—In the method described organic matter in the urine is destroyed with fuming nitric acid and the sulphur eventually precipitated as barium sulphate. As shown by duplicate tests, the method gives satisfactory results.

The methods of analysis of raw rubber, D. Spence (*Liverpool Univ., Inst. Com. Research Trop. Quart. Jour., 2 (1907), No. 5, pp. 91–104*).—The author discusses the need of a uniform method of analysis of rubber, and describes a method which in his experience has proved satisfactory.

Miscellaneous analysis, B. L. Hartwell (*Rhode Island Sta. Rpt. 1907, pp. 295–298*).—More or less complete analytical data are given regarding various fertilizer substances, poultry grit, malt sprouts, and materials used in a poultry feeding experiment, and the moisture, nitrogen, phosphoric acid, and potassium oxid content of several samples of hay.

Modification of the Soxhlet extractor, H. C. Wood, Jr. (*Amer. Jour. Pharm., 80 (1908), No. 3, p. 106, fig. 1*).—The modified form of the Soxhlet extractor, which, according to the author, is simple and inexpensive, consists of a narrow percolator, the lower end of which is connected by means of a tightly fitting

cork with a siphon-shaped glass tube, and the upper end closed with a perforated cork into which is fitted a glass T-tube. The rectangular limb of this tube is connected by a short piece of rubber tubing with a glass tube at right angles which passes down to the flask containing the solvent. Additional advantages, according to the author, are the ease with which the apparatus can be cleaned and the fact that by substituting different sizes of percolators it can be adapted with little trouble for use with either large or small quantities.

METEOROLOGY—WATER.

Precipitation, run-off, and evaporation on the earth's surface, R. Fritzsche (*Niederschlag, Abfluss und Verdunstung auf den Landflächen der Erde. Inaug. Diss. Halle, 1906, pp. 55; Ztschr. Gewässerk., 7 (1906), No. 6, pp. 321–370; rev. in Naturw. Rundschau, 22 (1907), p. 111; Mitt. Justus Perthes' Geogr. Anst., 53 (1907), No. 1, Literaturbericht, p. 16; Met. Ztschr., 25 (1908), No. 1, pp. 32–35*).—This dissertation deals with the methods of reckoning mean precipitation, and summarizes and discusses data bearing upon the balance of rainfall, run-off, and evaporation on the earth's surface, distinguishing between the relation of these three factors over water surfaces and land surfaces.

In reviewing this dissertation E. Brückner points out that over the water surface of the earth evaporation exceeds precipitation, but that 92 per cent of the evaporation falls again upon the water surface. On the land surface evaporation is decidedly smaller than precipitation, precipitation being about one and one-half times as great as evaporation. About 70 per cent of the precipitation on the land surface is derived from evaporation from the land.

On the kinds and distribution of viable micro-organisms in the atmosphere, Flemming (*Ztschr. Hyg. u. Infectionskrank., 58 (1908), No. 3, pp. 345–385, figs. 2*).—The results of numerous bacteriological examinations of air collected by means of captive and free balloons at different heights and places over land and sea are reported.

Monthly Weather Review (*Mo. Weather Rev., 36 (1908), Nos. 3, pp. 51–84, fig. 1, charts 17; 4, pp. 85–124, charts 16*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of March and April, 1908, recent papers bearing on meteorology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 3.—Accidental Variations in Atmospheric Pressure in the United States (illus.), by A. J. Henry; Is There a Type of Storm Path, by E. Van Cleef; The Present and Future State of Maritime Meteorology, by H. Hergesell; Abstracts of Russian Meteorological Memoirs, by A. Voeikov; The Study of Evaporation, by A. Voeikov; The Evaporating Power of the Air at the New York Botanical Garden, by C. S. Gager; Radium—Its Properties, Distribution, and Influence on the Atmosphere, by W. W. Strong; and Tornado of January 31, 1908 (illus.), by W. S. Belden.

No. 4.—Chinook Winds in Eastern Colorado During December, 1907, by L. H. Daingerfield; Climate of Kansas, by T. B. Jennings (see 115); Lightning and Powerful Electric Discharges; A Collection of Mean Annual Temperatures for Mexico and Central America, by P. P. Calvert; A Small Cloudburst Near Shasta, Cal., by R. H. McCandless; Local Changes of Climate, by W. C. Devereaux; Ice Columns in Gravelly Soil, by E. D. Bourne; Popof and Erman on the Use of Kites in Meteorology; Forecasting on the Pacific Coast, by A. G. McAdie; Can We Protect Against Tornadoes? The Observatory on Mount Etna; Dustfall in Idaho; Meteorological Education; The Law of the Earth's Nocturnal Cooling, by W. H. Jackson; Early Meteorological Data for Saline,

Mich., by J. E. Buchanan; Excessive Precipitation at Louisville, Ky., by F. J. Walz; A New Formula for Computing the Solar Constant from Pyrheliometric Observations, by H. H. Kimball; and Störmer's Work on the Physics of the Aurora, by P. G. Nutting.

Meteorological work [of the Alaska Stations], C. C. Georgeson (*Alaska Stas. Rpt. 1907, pp. 87–98*).—Tabular summaries are given of the reports of the volunteer weather observers of the Weather Bureau of Alaska on temperature, precipitation, and general weather conditions during the year ended November 30, 1907.

Climate of Kansas, T. B. Jennings (*Mo. Weather Rev., 36 (1908), No. 4, pp. 88–92*).—Extremes and means of temperature and precipitation are given for each month during 20 years, 1887–1906, with notes on frosts, winds, snowfall, thunderstorms, and hailstorms. "The mean annual temperature varies between 51° in the extreme northwestern counties and 57° in the extreme southeastern. . . . The average annual precipitation ranges from 15.37 in. in the extreme western to 44.54 in. in the extreme southeastern part of the State."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander, T. A. Barry, and R. C. Lindblad (*Massachusetts Sta. Met. Buls. 233, 234, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during May and June, 1908. The data are briefly discussed in general notes on the weather of each month.

Meteorological observations (*Michigan Sta. Rpt. 1907, pp. 123–134*).—Tabulated daily and monthly summaries are given of observations during 1906 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc.

Report of meteorologist, N. Helme (*Rhode Island Sta. Rpt. 1907, pp. 381–397*).—Observations at Kingston on temperature, precipitation, prevailing winds, and general character of the weather are given for each month of the year ended June 30, 1907. The mean temperature for that period was 46.5°, the precipitation 48.01 in., and the number of clear days 136.

Weather of the year 1907 in Switzerland, R. Billwiller (*Schweiz. Ztschr. Forstw., 59 (1908), Nos. 2, pp. 46–52; 3, pp. 78–84*).—The meteorological conditions during each month of the year are described, and observations on temperature, precipitation, and sunshine at various stations in Switzerland are summarized.

Meteorological observations in Surinam and Curaçao, 1907 (*Meteorologische Waarnemingen gedaan op de Meteorologische Stations in de Koloniën Suriname en Curaçao in het Jaar 1907. [1907], pp. 16*).—Observations on pressure, temperature, precipitation, etc., at Paramaribo, Surinam, and on precipitation at various places in Surinam and Curaçao and other parts of the Dutch Antilles are given.

The climate of the British Isles, A. Watt (*Scot. Geogr. Mag., 24 (1908), No. 4, pp. 169–186, figs. 9*).—The general climatic conditions are described and the distribution of temperature and rainfall is discussed in some detail. The question of change of climate is also briefly touched upon. It is stated that no definite answer can be made to this question, although there appears to be a very general opinion that the winters in the British Isles have on the whole grown milder.

Climate of the Bahama Islands, O. L. Fassig (*The Bahama Islands. New York, 1905, pp. 111–125, maps 3*).—This is a chapter in a monograph on the Bahama Islands, issued by the Geographical Society of Baltimore. It discusses the climate of the islands as a whole, the temperature, relative humidity, clouds and sunshine, rainfall, winds, thunderstorms, and especially hurricanes.

Forests and rainfall, E. Henry (*Indian Forester, 34 (1908), No. 2, pp. 69–81*).—This is an English translation of the original French article. A previous article in the same series dealt with the levels of underground water in and outside of forests (E. S. R., 18, p. 942).

The present article discusses the moisture content of the air over forests and open land, and the influence of forests upon rainfall and the flow of springs. In the previous article it was shown that the ground water level was much lower under forests than under adjacent open land. The conclusion is drawn from the data reported in this article that the moisture content and the chances of rain are much greater over forests than over open land. It is stated that observations made in various localities show that forests increase the rainfall 8 to 15 per cent above normal. Forests also exert a beneficial influence in maintaining a more uniform flow of springs. The foregoing conclusions, however, apply more particularly to level country. The problem is more complicated in hilly or mountainous areas. It is recognized that the chief factor affecting rainfall is the configuration of the ground, but it is maintained that other conditions being equal wooded hills are better agents for promoting precipitation than bare hills. Experimental data on this point are, however, deficient.

The level of underground water in forests and in the open, P. Ototzky (*Ann. Sci. Agron., 3. ser., 2 (1907), I, pp. 116–119*).—This is a review of the contents of a 2-volume book by Ototzky on Underground Waters, Their Origin, Regime, and Distribution, which contains an account of investigations on the subject of this article made in Gascony in 1902, showing, as many other observations had done, that the level of the ground water is lower under forests than in the open. (See also E. S. R., 16, p. 672.)

The level of subsoil waters with regard to forest, R. S. Pearson (*Ann. Sci. Agron., 3. ser., 2 (1907), I, pp. 104–115*).—A French translation of an article already noted (E. S. R., 18, p. 942).

Recent changes of methods and equipment in the water resources work of the United States Geological Survey, J. C. Hoyt (*Engin. News, 60 (1908), No. 1, pp. 15, 16, figs. 2*).—Several changes in the instruments and methods used in stream gaging by the Water Resources Branch of the U. S. Geological Survey are described.

Effect of low temperature on bacteria in ice, J. C. Sparks (*Sci. Amer. Sup., 65 (1908), No. 1695, pp. 410, 411*).—Tests are reported in this article from which the conclusion is drawn "that ice, even when cut from water which may contain pathogenic bacilli, is utterly incapable of passing on disease if it is stored for some time before being distributed."

Sewage purification works of the State Agricultural School, St. Anthony Park, Minn., F. H. Bass (*Engin. News, 59 (1908), No. 26, pp. 685, 686, figs. 4*).—The construction and efficiency of these works, which consist of a septic tank, a percolating filter, and a sand filter and cost about $9,000, are described.

SOILS—FERTILIZERS.

Soil Studies, II: Acid soils, A. W. Blair and E. J. Macy (*Florida Sta. Bul. 93, pp. 45–69, figs. 2*).—This bulletin reports the results of an investigation which was undertaken to find out to what extent acid soils are distributed in Florida and discusses the origin and nature of Florida soils with reference to the causes of acidity.

Of 189 samples of soils and subsoils, representing 17 counties of the State, 68.22 per cent of the soils and 51.35 per cent of the subsoils were found to be more or less acid when tested by Veitch's limewater method (E. S. R., 16, p. 14). With only one or two exceptions the soils are more acid than the subsoils,

and the cultivated soils are more acid than the virgin soils. With one exception the muck soils examined are extremely acid."

The average lime requirement of the acid soils as determined by the Veitch method was approximately 500 parts per million, equivalent to 1,500 lbs. per acre to a depth of 9 in. There was found to be about three times as much nitrogen in the soils as in the subsoils, slightly more than three times as much in the subsoils as in the second subsoils, and nearly one and one-half times as much in cultivated soils as in virgin soils.

"Experiments by the wire-basket method showed a gain in baskets where lime was used, over baskets where no lime was used, of 17.3 per cent green weight, and of nearly 20 per cent dry weight. With a muck soil which was very acid, the gain in baskets where finely ground limestone was used, over baskets where no limestone was used, was nearly 100 per cent green weight and 120 per cent dry weight."

It is pointed out that Florida soils are composed very largely of sand which has been derived from disintegrated rock, the process of formation being such as to remove to a large extent the basic constituents such as potash, lime, and magnesia. The soils are therefore fundamentally acidic. The acidity is, however, increased by the decomposition of organic matter.

Some notes on soil acidity, F. W. Morse and B. E. Curry (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 298*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society. "The authors report the reactions taking place between a number of clays and some common salts. Also some reactions between the organic matter in soils and some common salts."

A natural model for the formation of dunes, S. Günther (*Sitzber. K. Bayer. Akad. Wiss., Math. Phys. Kl., 1907, No. 2, pp. 139–153, figs. 3*).—This is a discussion of typical forms of seacoast and inland dunes.

Washington soils, R. W. Thatcher (*Washington Sta. Bul. 85, pp. 3–56, figs. 2*).—This is the final report on a soil survey of the State begun in 1893 (E. S. R., 7, p. 375; 15, p. 658) embodying 89 new analyses and summarizing the results of all of the analyses (188) made since the beginning of the survey. The bulletin also contains a statement regarding the objects and methods of the soil survey, and brief discussions of origin and composition of soils and the relation of soil composition to fertility, and the soils of the different districts of the State are fully described. The samples of which analyses are reported represent soils from every county except one and include probably every typical soil of the State. "Practically every type known to soil students is represented somewhere in this State. We have every variation from almost pure sand to pure clay on the one hand and to pure peat on the other. In other localities special types, such as marls, glacial drift of several kinds, etc., are found. These variations in type are accompanied by almost the widest conceivable variations in chemical composition." The extreme variations in the percentages of the several constituents which have been found in the samples of soils analyzed are given as follows:

	Per cent.
Insoluble silica	3.014–90.716
Hydrated silica	.157–18.524
Soluble silica	.002– .938
Potash	.000– .829
Soda	.027– 1.632
Lime	.005–36.009
Magnesia	.000– 4.830
Iron oxid	.181–16.368

	Per cent.
Alumina	0.148–14.898
Phosphorus pentoxid	trace– .409
Sulphur trioxid	.000– .694
Carbon dioxid	.000–28.998
Humus	.084–51.000
Nitrogen	trace– 2.660

Summary of the soil survey of the State, R. W. THATCHER (*Washington Sta. Popular Bul. 7, pp. 8*).—A popular summary of the above.

Analyses of soils [of grass lands], J. W. TAYLOR (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 3, pp. 24–26*).—Analyses of samples of soil from 21 farms on which fertilizer experiments with grass have been carried on are reported. The samples were taken to a depth of 9 in. The analyses show very low percentages of lime in all except two of the soils. Two of the soils which overlie chalk were found to be practically devoid of lime.

Humid and arid soils of Rio Verde, R. GARCIA OSES (*Las Tierras de Riego y de Temporal en Riovcrde. Mexico, 1907, pp. 24*).—The nature and causes of the differences between the arid and humid soils of this region are discussed.

The origin of the fertile soils of western Morocco, L. GENTIL (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 5, pp. 243–246; abs. in Rev. Sci. [Paris], 5. scr., 9 (1908), No. 7, p. 221*).—The author concludes from his investigations that the very fertile black and red soils of this region are the resultant of decalcification of neogenic calcareous sandstones. Analysis of the black soil shows it to contain 0.15 per cent of nitrogen, 0.25 per cent of phosphoric acid, 0.46 per cent of potash, and 1.39 per cent of calcium carbonate; the red soil 0.2 per cent of nitrogen, 0.08 per cent of phosphoric acid, 0.21 per cent of potash, and 1.79 per cent of calcium carbonate. Chemical analysis does not explain the great fertility of these soils, which is believed to be due mainly to favorable conditions of rainfall and underground water supply.

Notes on Egyptian and Soudan soils, F. HUGHES (*Yearbook Khediv. Agr. Soc. Cairo, 1906, pp. 133–140*).—The variation in the physical character of Nile soils due to variations in the velocity of the flow of the water from which the soil deposits are formed and to admixture of wind-blown desert sand with the alluvial deposits is pointed out.

Analyses of 6 representative alluvial soils from Keneh Province are reported which show that "at least in purely alluvial soils, the amount of plant food contained in the various grades of the finer particles of the soil is practically the same." The availability of the plant food constituents as shown by the Dyer method was also very similar in the different grades of soil particles.

In case of soils with which desert sand has been mixed the plant food constituents decrease with an increase of the added sand.

Analyses of samples of soil from all parts of the Nile Valley show that the alluvial soils in most cases are very similar in composition to Nile silt. Analyses of desert soils not of alluvial origin show that these are much poorer than the Nile soils in mineral constituents and contain only slight traces of nitrogen.

The alluvial soils contain sufficient potash in available form to render the application of potash fertilizers unnecessary. Although the percentages of total and available phosphoric acid are larger than are usually considered sufficient for needs of crops the soils are as a rule benefited by application of phosphatic fertilizers. It is suggested that the inefficiency of the phosphoric acid in these soils may be due to the deficiency of organic matter. In other words, in soils which are naturally poor in organic matter it is necessary to set a somewhat higher figure as the limit below which phosphatic fertilizers may be dispensed with.

Contribution to the knowledge of the lands and the agriculture of Syria, H. AUHAGEN (*Ber. Land u. Forstw. Auslande, 1907, No. 16, pp. 85, figs. 49*).—This is a summary account of the geography, climate, soil, water supply, flora and fauna of agricultural importance, administrative and economic conditions, population, general systems of agriculture in vogue, irrigation, dry farming, animal breeding, and other incidental agricultural industries of this region, which is stated to be about one-half the size of the German Empire.

Soils [of the Malay States] and their analysis, M. K. BAMBER (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 9, pp. 274–277*).—Chemical and physical analyses of 3 samples of alluvial clays and 7 of sandy loams representing typical soils of the Malay States are reported.

It is stated that the soils of the Malay States are roughly divided into two distinct kinds, (1) flat alluvial clays or muds on the banks of the rivers near the seacoast, and (2) undulating low soils a few miles inland, varying from free sandy loams to heavy clays. There are also some peaty soils resting on clay a few miles from the coast.

As a rule the soils are not especially rich in plant food, but their physical properties are exceptionally good. The alluvial clays or muds are generally rich in nitrogen. Potash is frequently deficient, and the proportion of phosphoric acid is variable. The upland soils have a larger proportion of sand and coarser particles and as a result the natural drainage is better. They are richer in nitrogen than the proportion of organic matter would indicate, but are usually slightly deficient in potash and phosphoric acid.

Classification of soils, L. A. REBELLO DA SILVA (*Rev. Agron. [Portugal], 5 (1907), No. 10, pp. 294–301*).—This article briefly describes different types of soils and soil characteristics and gives analyses and a physico-chemical classification of a number of Spanish soils examined by the Schloesing method.

The nomenclature of soils, M. PARDO Y URBINA (*La Nomenclatura de las Tierras. Mexico, 1907, pp. 14*).—This article discusses the necessity for a uniform agricultural classification of the soils of Mexico.

Physiography for high schools, R. D. SALISBURY (*New York, 1908, pp. VIII + 531, pls. 24, figs. 469*).—It is stated in the preface that "this book has been prepared with the purpose of letting the beginner into the method of the science with which the book deals, as well as with the purpose of conveying information to him. It has been prepared with the conviction that the child likes to reason and to follow reasoning, and that reasoning and following reasoning contribute more to his mental growth than the accumulation of great numbers of facts. It has been written with the conviction that the growth of the pupil is more important than facts about physical geography." Directions for laboratory work are not given in the text, it being the author's opinion that such work will be most effective if suggested by the teacher. The book is divided into four parts, the lithosphere, earth relations, the atmosphere, and the ocean. The formation and general characteristics of soils are treated in the first part and climate and weather in the third.

Land ruin compared with soil improvement, C. G. HOPKINS (*Penn. Dept. Agr. Bul. 154, pp. 118–136*).—The results are given of continuous cropping without systematic manuring as compared with a system of soil improvement based upon the use of phosphates in connection with farm manures and green manuring with leguminous crops as applied especially to the soils of the Central West.

On the deep cultivation of soils, STRECKER (*Fühling's Landw. Ztg., 57 (1908), No. 2, pp. 46–64, figs. 14*).—The advantages of deep culture are briefly stated and different methods and appliances used in Germany for the purpose are described.

Methods of soil toxicology, O. Schreiner and E. C. Shorey (*Abs. in Science, n. ser., 27 (1908), No. 686, pp. 295, 296*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society. The importance of working out refined methods for the detection, isolation, and study of the small amounts of toxic organic bodies which are believed to exist in soils is pointed out, and the authors outline "methods of separating the organic matter from the large mass of inorganic material, and further separation of the pure organic body from the extraneous organic matter by methods of extraction, solution, precipitation, distillation, etc. The specific methods by which several harmful organic compounds have already been isolated from unproductive soils are given to illustrate the general principles involved."

The cause of soil sickness (*Mark Lane Express, 98 (1908), No. 3985, p. 145*).—This article reviews briefly the evidence supporting the view that soil sickness is due to poisonous excretions of the roots of plants.

Bacteriological investigations with reference to the drying of soils, O. Rahn (*Centbl. Bakt. [etc.], 2. Abt., 20 (1907), No. 1–3, pp. 38–61, pl. 1, fig. 1; abs. in Chem. Ztg., 32 (1908), No. 9, Repert., p. 47*).—From a large number of studies on the formation of acid in sugar solutions, carbon dioxid in sugar solutions containing calcium carbonate, and ammonia in urea and peptone solution, the conclusion is reached that bacterial changes go on much more rapidly in soils dried at room temperature than in similar samples kept moist or in the original moist soils. The difference in this respect between the dry and moist samples was in the case of garden soil about 60 per cent and in ordinary farm soil 10 to 30 per cent, but in case of a light sandy soil inappreciable. The rapidity with which the drying took place had very little influence on the difference in bacterial change. Since the number of organisms in soil samples was invariably decreased by drying it is difficult to explain the difference in bacterial activity. It can not be explained on the basis of physical properties, since such differences were observed in case of soil samples suspended in water and in extracts of the soils. Neither can decomposition of the soil constituents furnish an explanation, because with the liberal addition of potassium phosphate and asparagin similar differences were observed. Variations in the amount of nitrates in the soil were also without effect on the bacterial activity. Whatever the substances producing the difference it must be undecomposable by boiling and capable of passing through filter paper. It is not clear whether it acts by reducing bacterial activity in the moist soil or accelerating it in the dry soil. Dry soils lose the greater part of their intensified putrefactive power and do not differ materially from the original moist soils after they have been moistened about 24 hours. Mustard plants grew better in soils which had become dry than in those which had been kept moist continuously.

Tests of Remy's method of judging soils indicate that this method may give erroneous results if great care is not taken to prevent the loss of moisture from the cultures.

The influence of the composition of the medium upon the solvent action of certain soil bacteria, C. W. Brown (*Rpt. Mich. Acad. Sci., 9 (1907), pp. 160–162, figs. 3*).—A study of the solvent action of a large number of soil bacteria on rock phosphate, bone, pure tricalcium phosphate, dicalcium phosphate, and calcium carbonate is briefly reported.

The results show that 12 out of 25 bacteria isolated from soil exerted a definite visible solvent action on the substances named when supplied with some form of sugar in the nutrient medium. "One which produces no gas but a larger amount of acid from sugars than any of the others, shows the greatest action upon the calcium carbonate, while other germs which produce gas—largely carbon dioxid—but not as much acid as the former, give an action more

marked than that of the stronger acid producer upon the dicalcium and tricalcium phosphates. These points, with others noticed during the experiments, have led us to believe that, while acid is a great factor in dissolving insoluble phosphates, the carbon dioxid liberated from carbohydrates by the gas producing bacteria must not be overlooked as a solvent agent."

On the activity of bacteria in soils, J. Vogel (*Illus. Landw. Ztg., 27 (1907), No. 20, pp. 175, 176; abs. in Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 10, p. 299*).—This is a general explanation of bacterial activities in the soil and the conditions, especially the supply of humus and other energy-yielding material in the soil, favoring such activities. Humus is not considered a very efficient source of energy for the soil organisms, hence the necessity for increasing the supply of readily available energy-yielding materials in the soil if vigorous activity of the soil organisms is to be promoted. The author thinks it is still an open question whether the beneficial results following black fallow are due to increase of nitrogen or to the setting free of latent plant food in the soil. Reference is also made to the favorable results both as regards increase of yield and nitrogen content obtained in field experiments with leguminous plants (serradella, yellow lupines, and soy beans) inoculated with Hiltner's pure cultures of root-tubercle bacteria.

Atmospheric nitrogen, W. J. U. Woolcock (*Sci. Amer. Sup., 65 (1908), No. 1678, p. 143*).—A brief account is given in this article of the results of experiments by Professor Bottomley in England on soil inoculation and also on the possibility of the assimilation of free nitrogen by nonleguminous plants.

Bacteria inoculation in the culture of leguminous plants, J. Simon (*Sächs. Landw. Ztschr., 55 (1907), Nos. 33, pp. 877–881; 34, pp. 901–905*).—This is a general discussion of this subject and of the relative merits of commercial preparations of root-tubercle bacteria (nitragin, nitroculture, etc.) based in part upon experiments at the Tharand experiment station.

The assimilation of free nitrogen by micro-organisms, E. Boullanger (*Bul. Inst. Pasteur, 6 (1908), Nos. 1, pp. 1–12; 2, pp. 49–56; 3, pp. 97–104*).—This is a review of investigations and a critical discussion of the present status of knowledge on this subject, including a bibliography of 84 references to the more important investigations.

Note on de Rossi's article on the organisms which produce the root tubercles of leguminous plants, R. Perotti (*Malpighia, 21 (1907), No. 4–6, pp. 255–262*).—The author cites evidence tending to show that other investigators besides de Rossi have isolated specific organisms from the tubercles of leguminous plants, and calls attention to the fact that although in earlier publications de Rossi casts doubt upon this point, in later reports (E. S. R., 19, p. 519) he is careful to disclaim any specific denial of such isolation by other investigators.

Contribution to the knowledge of denitrification processes, H. Kühl (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 8–9, pp. 258–261; abs. in Chem. Zentbl., 1908, I, No. 10, pp. 980, 981*).—A series of experiments are reported which show (1) that the activity of denitrifying organisms was greatly increased under anaerobic conditions (covering the culture solutions with oil, paraffin, etc.), (2) the denitrifying power of pure cultures was greatly increased by adding mixed cultures, and (3) that sea slime set up rapid denitrification in culture solutions.

The construction of manure pits and the preservation of manure, P. Cornelius (*Mitt. Deut. Landw. Gesell., 22 (1907), No. 48, pp. 409–413, figs. 3*).—Plans and descriptions are given of manure pits with systems for the collection of the liquid portion and the convenient arrangement of these pits with reference to the cattle stalls and the handling of the manure is explained.

Plans for the construction of manure pits, Friz (*Württemb. Wchnbl. Landw., 1908, No. 1, pp. 4–7, figs. 3*).—Descriptions and plans of various kinds of manure pits are given.

Demonstration experiments with fertilizers in Carinthia during 1905 and 1906, H. Svoboda (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 1, pp. 22–35; abs. in Chem. Zentbl., 1908, I, No. 8, p. 759*).—The cooperative experiments of previous years (E. S. R., 16, p. 761; 17, p. 753) were continued during 1906 and the results of 151 such experiments carried out during that year are reported in detail in this article, a comparison being made of both the direct (first year) and after effect of the various fertilizers on oats, potatoes, and hay meadows.

As in previous experiments, combinations of Thomas slag and potash salts were used on grasses and of superphosphate, potash salts, and nitrate of soda on oats and potatoes. The after effects of the commercial fertilizers were very good, especially on the grasses. In this case not only was the second cut of grasses increased, but the yield the second year after the application of the fertilizers was greater than the first year. It was also observed that under the unfavorable weather conditions of both 1905 and 1906 the meadows which had received fertilizers suffered much less injury than those which had not been fertilized. The results obtained with barnyard manure combined with commercial fertilizers lead to the conclusion that while it is not advisable to completely replace manure with commercial fertilizers, the yield and profit can be greatly increased by judiciously supplementing the manure with such fertilizers.

The results of field experiments with fertilizers on sandy soils in a bad state of cultivation, Clausen (*Deut. Landw. Presse, 35 (1908), Nos. 11, pp. 105, 106; 12, pp. 115, 116*).—Kainit, nitrate of soda, and sulphate of ammonia with superphosphate and Thomas slag were tested in pot and field experiments with oats and potatoes. The effect of the different fertilizers and fertilizer combinations on the yield and nitrogen content of the crop is discussed.

Influence of fertilizers on the composition of wheat, H. Snyder (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 297*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society, the essential features of which have been noted from another source (E. S. R., 19, p. 941).

On nitrogenous fertilizers and their application, P. Lavenir (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 3 (1907), No. 7–9, pp. 199–217*).—This article discusses the source, value, and use of nitrate of soda, sulphate of ammonia, the artificial compounds prepared from atmospheric nitrogen, and various nitrogenous fertilizers of animal and vegetable origin, as well as green manures.

Nitrates as soil renovators, O. Schreiner and H. S. Reed (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 296*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society. Attention is called in this paper to the possible action of nitrates in aiding in the destruction of harmful organic substances which may be present in unproductive soils. Observations and investigations are reported which indicate that the roots of plants have a strong oxidizing power and that this power is greatly increased by the addition of nitrates, the combined action of the two being sufficient to destroy harmful organic bodies and thus to improve conditions for plant growth. It was shown by chemical analysis that when toxic bodies were used in the experiments they were destroyed by the plant and nitrates.

The nitrogen capacity of cultivated soils with one-sided fertilization with nitrate of soda, T. Pfeiffer (*Fühling's Landw. Ztg., 57 (1908), No. 2, pp. 41–46*).—On the basis of his own previous work and that of other investigators the author argues that the use of nitrate of soda and sulphate of ammonia,

especially the former, as the exclusive sources of nitrogen supply for soils may result in actual impoverishment of the soil in nitrogen. He therefore considers exclusive use of such fertilizers a questionable practice.

On the decomposition of lime nitrogen and nitrogen lime, II, F. Löhnis and A. Sabaschnikoff (*Centbl. Bakt.* [*etc.*], *2. Abt., 20 (1908), No. 11, pp. 322–332, fig. 1*).—In previous experiments (E. S. R., 17, p. 345) Löhnis showed that calcium cyanamid was decomposed and dicyandiamid was produced by the action of water without the intervention of micro-organisms. He also showed that under favorable conditions the nitrogen of the cyanamid was completely transformed into ammonia by the action of various ammonifying bacteria, experiments with pure cultures indicating that urea was an intermediary product in the process of formation of ammonia. This activity of the bacteria was greatly increased by the addition of small amounts of asparagin and grape sugar (about 0.1 per cent). Experiments of similar character showed that in solutions of calcium cyanamid which had been repeatedly heated and in which the formation of ammonia had been started by the action of steam the decomposition resulting from the inoculation of the solution with 10 per cent of soil was as rapid as in case of freshly prepared unheated solutions.

The investigations reported in the present article were undertaken to explain if possible the contradictory results obtained by von Seelhorst, Immendorff, Kappen, and others on the one hand, and by Ulpiani and Perotti on the other, with special reference to the formation and decomposition of dicyandiamid.

Further experiments showed a decided advantage as regards the ammonification of the nitrogen of lime nitrogen and nitrogen lime from the addition of asparagin and grape sugar to the culture solutions in Remy's process. The authors never succeeded in producing ammonia in solutions of dicyandiamid inoculated with soil. When, however, the solutions of lime nitrogen and nitrogen lime were repeatedly heated the nitrogen was rapidly ammonified by a number of soil organisms. In this case it is believed that not dicyandiamid but dicarbimid is produced, which is more easily converted into ammonia.

Of various soil organisms experimented with *Bacterium erythrogenes*, *B. kirchneri*, and *B. lipsiense* were especially active in producing ammonia. A less active organism in this respect was *B. vulgare* var. *zopfii*.

Observations during two years on the influence of season and weather upon the decomposition of lime nitrogen and nitrogen lime in the soil showed that the most active decomposition occurred in May, the least in August, and that there was another period of activity in September, the curves being practically identical for the two seasons, although the first was dry and the second wet.

Nothing was observed in these experiments to indicate that the lime nitrogen or nitrogen lime in any way interfered with the process of nitrification.

Recent investigations on the decomposition and the action of lime nitrogen and nitrogen lime, F. Löhnis and A. Sabaschnikoff (*Fühling's Landw. Ztg., 57 (1908), No. 1, pp. 15–29*).—In this article the authors discuss their own investigations on this subject (see above) as well as the bearing of recent work by Perotti and Kappen (E. S. R., 18, pp. 537, 1028) on their conclusions with reference to the decomposition of calcium cyanamid in the soil and the fertilizing value of the commercial forms of this compound. They maintain that recent investigations have confirmed the conclusion that calcium cyanamid is not converted to any appreciable extent into ammonia in sterile soils and that this transformation is due to the activity of micro-organisms; that under suitable conditions the transformation of the cyanamid as well as the dicyanamid into ammonia by bacterial action is almost complete; and that the transformation into ammonia and ultimately into nitrates which are readily available to crops is

indicated by the action of these materials in increasing the yield of crops in pot experiments, the fertilizing efficiency shown by lime nitrogen, nitrogen lime, and dicyanamid comparing very favorably with that of ammonium sulphate. It is shown that by heating and especially evaporating the solution of lime nitrogen the rapidity of transformation into ammonia by the action of micro-organisms is greatly accelerated.

The authors conclude that while it may be possible under favorable conditions to secure a transformation of 99 per cent of the nitrogen of calcium cyanamid into ammonia and finally into nitrates, it is not likely that such high efficiency as this indicates can be obtained in practice.

Experiments with new nitrogenous fertilizers, L. Malpeaux (*Betterave, 18 (1908), No. 446, pp. 67–70*).—Experiments made at the agricultural school of Berthonval during 1907 with basic lime nitrate and calcium cyanamid on barley and oats are reported. The results obtained with the first were somewhat superior to those obtained in case of nitrate of soda. The second gave results about equal to those obtained with sulphate of ammonia.

Experiments with calcium cyanamid, A. D. Hall (*Jour. Bd. Agr. [London], 14 (1908), No. 11, pp. 652–661*).—The experiments reported deal mainly with the question of the changes which calcium cyanamid is likely to undergo under different conditions. The principal conclusions drawn from the experiments are "that calcium cyanamid as now manufactured can be stored for a reasonable time under ordinary conditions without danger or sensible loss of its fertilizing properties; cyanamid can also be mixed without difficulty or loss with superphosphate, the resulting mixture being as easily handled as any other artificial manure."

Nitrolime, G. L. Ragondet (*Jour. Soc. Agr. Brabant et Hainaut, 53 (1908), No. 9, pp. 219–223*).—The manufacture, properties, composition, keeping quality, and use as a fertilizer of calcium cyanamid are briefly discussed in this article.

The effect of the addition of sodium to deficient amounts of potassium, upon the growth of plants in both water and sand cultures, B. L. Hartwell, H. J. Wheeler, and F. R. Pember (*Rhode Island Sta. Rpt. 1907, pp. 299–357, pl. 1*).—This is an account of investigations carried on in cooperation with the Bureau of Soils of this Department and "gives the results of growing wheat seedlings in complete nutrient solutions containing deficient, and approximately optimum amounts of potassium, and the same supplemented by sodium and again by extra calcium.

"Sodium seemed to cause no increase in growth when an optimum amount of potassium was present, but when the deficiency of potassium was great enough to cause about a 30 per cent depression in the green weight produced, the addition of sodium did give an increase in growth which usually amounted to 10 per cent, or more, within a period of from two to three weeks, under the particular conditions of these experiments.

"The extra calcium did not on the whole increase the growth, either when used with an optimum or a deficient amount of potassium.

"The beneficial effect of sodium, when accompanying a small amount of potassium, is not attributed to the increase in the osmotic pressure of the solution, because the addition of extra calcium, magnesium, phosphorus, or nitrogen failed to cause an increase in growth.

"The increase in transpiration was usually less than that in green weight, when sodium was added, or the potassium increased. This seemed especially marked with the alkali carbonates.

"A larger amount of potassium was left in the solution by the growing seedlings when the potassium in the nutrient medium was supplemented by sodium. In other words, sodium was a conserver of potassium.

"In two experiments by the paraffined wire basket method, with white quartz sand which had been digested with acid, sodium, when supplementing a deficient amount of potassium, affected the growth similarly as in the solution experiments."

The partial substitution of potassium by sodium as a plant food, B. L. Hartwell, H. J. Wheeler, and F. R. Pember (*Abs. in Science, n. ser., 27 (1908), No. 686, pp. 298, 299*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society, the essential features of which are given in the paper noted above.

What is the relation of the increase in yield of barley produced by phosphatic fertilizers to the phosphoric acid content of the soil? F. Pilz (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 1, pp. 36–51; abs. in Chem. Zentbl., 1908, I, No. 8, pp. 759, 760; Jour. Chem. Soc. [London], 94 (1908), No. 547, II, p. 423*).—From the results of a large number of observations on the relation between increased yield of different varieties of barley produced by application of phosphatic fertilizers and the phosphate, nitrogen, and potash contents of the soils the conclusion is drawn that the higher the phosphoric acid content of the soil the greater is the benefit resulting from the application of phosphatic fertilizers. Superphosphates were in general more effective on rich soils (containing over 0.2 per cent each of nitrogen, potash, and phosphoric acid) than on poor soils (containing less than these percentages). This explains the fact often observed in practice that the use of phosphatic fertilizers on poor soils frequently results in a depression in yield and poor ripening of barley.

Phosphorus and humus in relation to Illinois soils, C. G. Hopkins (*Illinois Sta. Circ. 116, pp. 27*).—This is an address which was delivered before the Illinois State Farmers' Institute, and discusses the improvement of the common prairie soils of the Illinois corn belt by means of rotations and the use of fine-ground limestone, rock phosphate, and organic manures, the main object being to increase the phosphorus and humus content of the soils.

On the behavior of minerals in soils, P. Vinassa de Regny (*Staz. Sper. Agr. Ital., 41 (1908), No. 1, pp. 51–77*).—The results of investigations, particularly those of the Bureau of Soils of this Department, and of Delage and Lagatu (E. S. R., 17, pp. 226, 841), bearing on the solubility of various mineralogical constituents of soils are summarized and discussed. A bibliography of 48 references to literature on the subject is given.

Effect of lime and gypsum on the solubility of potassium in feldspars, F. W. Morse and B. E. Curry (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 295*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society. The authors found that lime and gypsum in contact with feldspar increased the solubility of potassium. The fact that this effect was not observed when ordinary clay soils were treated in the same way is attributed to the removal of potassium from solutions by the absorbent power of the clay.

Note on the effect of lime upon the availability of the soil constituents, F. B. Guthrie and L. Cohen (*Agr. Gaz. N. S. Wales, 18 (1907), No. 12, pp. 952–956; Hawaii. Planters' Mo., 27 (1908), No. 1, pp. 32–37*).—Experiments on the solubility in water and 1 per cent citric acid of phosphoric acid and potash in light sandy soil, garden loam, and very stiff clay before and after treatment for one month with 1 per cent of freshly slaked lime, as well as the changes which the nitrogen underwent as a result of such treatment, are reported.

The water-soluble phosphoric acid decreased during the experiment in all of the soils and the potash in the clay soil. The amount of water-soluble plant food, however, was larger in the limed than in the unlimed soils, but only in the sandy soil did the liming increase the proportion of water-soluble phosphoric

acid and potash over that originally present in the soil. Digestion with citric acid showed very little alteration in the amounts of soluble constituents during the experiment, the effect of liming being much less marked in this case than in case of the water-soluble constituents.

The examination of the soils after 8 months with reference to changes in the nitrogen showed a large increase in the proportion of nitrite nitrogen in the limed soil. The total nitrogen as nitrite and nitrate increased in all cases, although the nitrate nitrogen remained almost stationary except in the clay soil. The fact that there was no loss of the very soluble nitrites and nitrates is taken to indicate that the decrease of water-soluble potash and phosphoric acid was not due to percolation through the walls of the pots so much as to conversion into less soluble forms.

Experiments with lime and crushed limestone on a Pennsylvania clay loam soil, W. Frear (*Penn. Dept. Agr. Bul. 154, pp. 79–85*).—This article summarizes briefly the results obtained in a series of experiments at the Pennsylvania Experiment Station which have been continued since 1880. The results show in brief that the use of burnt lime under the conditions of these experiments, namely, in excessive amounts on a soil in no particular need of lime, caused a net decrease rather than a gain in production, whereas with carbonate of lime there was a slight increase in yield, but entirely insufficient to pay the cost of application.

The relation between the effects of liming, and of nutrient solutions containing different amounts of acid, upon the growth of certain cereals, B. L. Hartwell and F. R. Pember (*Rhode Island Sta. Rpt. 1907, pp. 358–380, pls. 2*).—Field experiments having shown that rye and barley are very differently affected by liming, the water cultures with these crops here reported were undertaken to determine "whether varieties of plants which were most benefited by liming were likewise most susceptible to injury by certain acids, when their seedlings were grown in nutrient solutions possessing definite degrees of acidity. . . .

"The water-culture experiments showed that barley seedlings were not more susceptible than rye seedlings to injury from acidified nutrient solutions, even though the field results proved that barley received very much more benefit than rye, from liming.

"While recognizing the caution which should be exercised in drawing conclusions concerning growth in the soil, from results secured by solution cultures, it seems certain, in searching for an explanation of the great differences exhibited by different kinds of plants in respect to liming, that other chemical properties of lime should be prominently studied along with its function as a corrector of acidity, even when attention has been given to the plant-food ingredients.

"According to the method of experimentation employed, the growth of wheat, rye, barley, and oat seedlings was not materially influenced by any degree of alkalinity which is insufficient to cause precipitation from an ordinary nutrient solution.

"The growth of these same seedlings, in nutrient solutions, was likewise scarcely affected by an acidity equal to about $\frac{N}{500}$ or less. A depression in green weight of about 20 per cent resulted when the acidity equalled $\frac{N}{250}$, and an increase in the acidity to about $\frac{N}{170}$ and $\frac{N}{125}$, decreased the production of green weight around 40 and 60 per cent, respectively.

"The very marked property of the seedlings of rendering the nutrient solutions alkaline was measured by titrations against standard acid at the end of the final periods of growth.

"Even if it should be proven beyond question that the so-called acid soils are not injurious to the growth of certain plants because of a noxious degree of acidity, but rather owing to accompanying toxic compounds, it would surely be unwise to discontinue the use of the litmus paper or other tests for soil acidity so long as valuable indications are afforded by them concerning the need of applications of basic material."

The relation between the effects of acid in nutrient solutions, and of liming, B. L. Hartwell and F. R. Pember (*Abs. in Science, n. ser., 27 (1908), No. 686, p. 298*).—This is an abstract of a paper presented at the Chicago meeting of the American Chemical Society, the essential features of which are given in the paper noted above.

Analysis of a sample of synthetic calcium nitrate, N. Passerini (*Bol. Ist. Agr. Scandicci, 2. ser., 7 (1908), No. 1, pp. 108–111*).—The average percentage of total nitrogen found by the Ulsch and Schloesing methods was 12.9. Complete analysis of the material showed calcium oxid 25.7 per cent, nitric anhydrid 49.7 per cent, and water of hydration 23.7 per cent. There were in addition small amounts of nitrous acid, magnesia, and insoluble substances.

Tennessee white phosphate (*Amer. Fert., 28 (1908), No. 2, pp. 5–10, figs. 2*).—This article deals especially with the Wilsdorf deposits, discussing their origin and extent, but also treats briefly of deposits in other parts of the district.

Composition of ashes from Vesuvius, E. Comanducci (*Gaz. Chim. Ital., 36 (1906), II, No. 5–6, pp. 797–812; abs. in Rev. Sci. [Paris], 5. ser., 8 (1907), No. 25, p. 787; Rev. Gen. Agron., n. ser., 3 (1908), No. 1, p. 2*).—The analyses of ashes ejected during the eruption of April 4 and 5, 1906, reported in this article show that Vesuvius is a potassic volcano, the ashes containing 4.66 per cent of potash. They also contain considerable amounts of phosphoric acid (0.75 per cent), and some ammonia (0.03 per cent), nitrous acid (0.001 per cent), and nitric acid (0.0005 per cent). It is reported that the ashes ejected in 1904 contained as high as 1.43 per cent of phosphoric acid. These figures indicate that the ashes have considerable fertilizing value as sources of potash and phosphoric acid. The more important of the other constituents of the ashes reported are soda 4.63 per cent, lime 11.97 per cent, iron sesquioxid 12.29 per cent, iron protoxid 2.72 per cent, alumina 16.75 per cent, and silica 43.69 per cent.

Kainit, Jubartre (*Prog. Agr. y Pecuario, 13 (1907), No. 561; 14 (1908), No. 565, pp. 54–56*).—This article reviews, with numerous references to literature, the investigations relating to the use and value of kainit as a fertilizer, insecticide, and fungicide. The author concludes that it has been clearly demonstrated that the material is of decided value for all these purposes.

Garbage tankage, R. McMurtrie (*Amer. Fert., 28 (1908), Nos. 2, pp. 11–16; 3, pp. 5–10*).—The composition of garbage is given and methods and machinery used in treating it are described, particularly those employed in the preparation of fertilizing material from garbage.

Analyses of fertilizers for consumers, J. S. Burd (*California Sta. Circ. 36, pp. 2*).—The conditions under which consumers may have samples of fertilizers examined by the station, in conformity with the State fertilizer law, are explained in this circular.

Analyses of commercial fertilizers, M. A. Scovell, H. E. Curtis, and G. Roberts (*Kentucky Sta. Bul. 132, pp. 111–195*).—This bulletin reports analyses of 636 samples of fertilizers examined during 1907. Of these "118, representing 101 brands and 29 firms, fell so far below the guarantied analyses in phosphoric acid, nitrogen, or potash, or any two, or all three of these ingredients, that the deficiencies could not be accounted for by variations in sampling or analysis."

Analyses of commercial fertilizers, W. FREAR (*Penn. Dept. Agr. Bul. 159, pp. 69*).—This bulletin reports and discusses the results of analyses of 602 samples of fertilizers examined during the period from January 1 to August 1, 1907.

Licensed commercial fertilizers, 1908, F. W. WOLL and G. A. OLSON (*Wisconsin Sta. Bul. 163, pp. 3–19*).—The results of inspection during the year are reported, with a general discussion of commercial fertilizers and the main principles governing their application.

AGRICULTURAL BOTANY.

The origin of the potato, C. T. DRUERY (*Gard. Chron., 3. ser., 43 (1908), No. 1106, pp. 154, 155, figs. 6*).—An account is given of investigations of A. W. Sutton, which have been carried on for about 20 years to determine the wild species of Solanum that yields the potato of commerce, and also, if possible, to increase the resistant powers of the commercial potato against disease by infusion of a stronger strain. The studies so far have failed to show the origin of the cultivated potato. In every case where the truly wild nature of a species was determined the offspring invariably came perfectly true to the parental type.

In these studies one species, *S. etuberosum*, has been under observation for 20 years, and although its name would imply that it is nontuber bearing, yet tubers have been produced that in the course of the experiment have increased from less than an inch in diameter to tubers of marketable size, while in flavor they do not differ from the ordinary potato. The specific characters of *S. etuberosum* are such as to separate it quite distinctly from the cultivated potato, but it appears promising as a source of edible tubers and of particular value on account of its having proved resistant to the potato disease due to *Phytophthora infestans*. In all the experiments thus far carried on this fungus has never been observed either on the stems or tubers of this species.

Incidental to this investigation, attention is called to the similarity between the variety known as Blue Giant and that described as the Violet variety of *S. commersonii*. These two do not differ in any material character in the foliage, method of branching, flower cluster, seed capsules, or pollen grains, and both differ in common characters from cultivated material of the truly wild species, *S. commersonii*.

Texas honey plants, C. E. SANBORN and E. E. SCHOLL (*Texas Sta. Bul. 102, pp. 31*).—This bulletin contains brief notes on a large number of Texas honey plants, relative to their geographical distribution and honey-producing qualities. In many instances reference is made to the respective quality and yield of pollen and propolis, and data are given concerning the weather conditions and their effects upon the yield of certain plants. The plants are discussed by families, and wherever possible the common name is also given.

The bulletin represents work of the department of entomology for several years past, although the bulk of the work was accomplished by L. H. Scholl, assistant and apiarist from 1902 to 1906.

The poisonous properties of the beans of Phaseolus lunatus, W. R. DUNSTAN and T. A. HENRY (*Jour. Bd. Agr. [London], 14 (1908), No. 12, pp. 722–731*).—Attention is called to the poisonous properties of certain varieties of beans of the species *P. lunatus*. It has usually been stated that the white varieties contain little or none of the glucosid which yields hydrocyanic acid when acted upon by an enzym, and the authors have investigated a number of white and colored varieties which were received from Burma to determine the possibility of their containing glucosids in toxic amount. The red and white varie-

ties of these beans are quite extensively imported into England and other parts of Europe for feeding stock as well as for human food.

An examination of these beans showed that many contained prussic acid in injurious amounts. It has been stated that by cooking them the glucosid is removed, but there appear to be indications that this is not always the case. In view of the interests concerned, the authors think it desirable that an extended investigation be carried on to determine their suitability for use as a feeding material, particularly as many of the white varieties may come into use as a human food, since they closely resemble the small haricot beans in appearance.

A quantitative study of transpiration, Grace L. Clapp (*Bot. Gaz., 45 (1908), No. 4, pp. 254–267, figs. 2, graphs 30*).—A series of studies has been carried on to determine which of the plants available to American teachers are best adapted for the demonstration or investigation of the different physiological processes, and the present paper gives the results of the investigation on the transpiration of 30 species of plants. In this investigation the author determined the actual amount of water lost by the plants growing under ordinary conditions in greenhouses, and at the same time determined the transpiration under various conditions which admit of control and repetition.

The first choice in respect to excellence of material for study falls on *Chrysanthemum frutescens, Tropæolum majus, Pelargonium domesticum, Fuschia speciosa, Senecio petasitis, S. mikanioides, Pelargonium zonale, Heliotropium peruvianum,* and *Pelargonium peltatum.* These were found best since they lose large amounts of water, are easily obtainable at any time of the year, and may be readily grown in houses or in the greenhouse.

In the course of the study it was brought out that there are 2 daily extremes, a maximum about midday, when the sunlight is most intense, heat usually the greatest, and moisture in the atmosphere the least, but with a good supply of water in the soil. The minimum occurs some time during the night, when the temperature is low, the atmospheric moisture approaches saturation, the darkness is complete, and in most plants the stomata are closed.

It was further found that in general the transpiration of ordinary plants grown in greenhouses amounts to about 50 gm. per hour per square meter of surface for the daytime and 10 gm. at night.

The relation between the size of the stomata and photosynthesis in grasses, V. Kolkunov (*Zhur. Opuitn. Agron. (Russ. Jour. Expt. Landw.), 8 (1907), No. 4, pp. 369–381*).—In investigations previously noted (E. S. R., 19, p. 225) the author showed that the lowering of evaporation by cultivated plants is brought about by a reduction in the size of the stomata. As a measure of such lowering the author finds it convenient in grasses to consider the length of the stomata.

In connection with these investigations a study was made on the relation of photosynthesis to the size of the stomatic orifices. Experiments were carried on in which leaves of grasses were placed in tubes containing gas of a known carbon dioxid content, then kept for 1½ to 2 hours in the light and the remaining carbon dioxid determined. Experiments were carried on in this way with different varieties of wheat, barley, millet, and other grasses, and in each case the size of the stomata as well as the amount of carbon dioxid assimilated was noted.

The author was led to the general conclusion that the assimilation in grasses varies in proportion to the size of the stomatic orifices.

Incidental to this investigation it was found that the assimilation of different species was differently affected by like intensities of light. In one instance, on a dark rainy day the leaves of millet did not decompose any carbon dioxid, while the leaves of a variety of Turkestan wheat decomposed it as energetically as on bright sunny days.

The physiological function of potash in plants, J. Stoklasa (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 1, pp. 52–61*).—A preliminary account is given of experiments which were conducted with sugar beets and barley, to determine the physiological importance of potash for the growth and development of those plants. A lack of potash was found to interfere seriously with the photosynthesis of the plants. Where plants were grown under control conditions those receiving potash had a much higher content of starch and sugar than those where it was wanting or where the amount was deficient. In both barley and beets the ash from the above-ground or green parts of the plants was much richer in potash than was the ash of the roots. There appears to be an intimate connection between the assimilable potash present and the carbon dioxid assimilation of plants.

The influence of light and of copper on fermentation, J. E. Purvis and W. A. R. Wilks (*Proc. Cambridge Phil. Soc., 14 (1907), No. 4, pp. 361–372; Chem. News, 97 (1908), Nos. 2516, pp. 79–81; 2517, pp. 87–89*).—The results are given of a comparative study of the influence of light and various colors upon fermentation when conducted in unsterilized copper vessels, in sterilized glass vessels, and in unsterilized glass and copper vessels. The effects of the influence were traced in determinations of the optical activity, copper oxid reducing power, nitrogen content, acidity, and specific gravity of the distilled fermented solutions.

It was found that fermentation when carried on under sterilized and unsterilized conditions in glass vessels and under the influence of various colors, as well as of white light and also in darkness, was not seriously affected, as shown by determinations of the optical activities of the fermented solutions.

Fermentation when conducted in copper vessels, but otherwise under the same conditions, was found to be influenced very markedly, as shown by differences in the acidity, optical activity, etc., of the solutions. The light of different colors influenced the changes indirectly. It appears that copper dissolved from fermenting vessels very largely determined the course of fermentation. The results obtained under the influence of blue light proved that the inhibitory effect of this light on the development of acidifying bacteria decreased the amount of acid produced and therefore lessened the amount of copper dissolved. On the other hand, the fermentations under the influence of red light and in darkness gave better facilities for a more vigorous growth of the bacteria. The acid produced under these conditions dissolved a little of the copper, and its inhibitory effect on a normal growth of the yeast and a regular fermentation is evident from the results obtained in the different determinations.

Various contributory causes were noted, among them the influence of temperature, which varied under the different colored lights. It was further found that the original composition of the wort exercises an effect upon the resulting fermentation, a good yeast appearing to resist the action of copper better than a poor one.

On the variation of peroxidase in seeds, Brocq-Rousseu and E. Gain (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 10, pp. 545–548*).—In a previous note (E. S. R., 19, p. 931) the authors report the discovery of the fact that peroxidases do not persist indefinitely in seeds. In the present paper an account is given of an attempt made to determine the length of time that peroxidase could be recognized in seed, the specimens examined varying from 2 to 2,000 years in age.

The oldest seeds to show the presence of peroxidase were *Triticum hybernum* and *T. monococcum*, which were about 208 years old. The seeds of a few other species of plants that were more than 100 years old showed the reaction for

peroxidase, but except in a few cases it was found that peroxidase develops in the seeds only when they are 20 years old or less.

Studies on variegation and some accompanying phenomena, II. LINDEMUTH (*Landw. Jahrb., 36 (1907), No. 5–6, pp. 807–862, pls. 2, figs. 16*).—A report is given of studies made on variegation in a large number of plants, principally species of Malvaceæ. Various theories of variegation are discussed and the results of extended experiments in the transmission of that phenomenon through grafting, cuttings, and seedlings are given.

Recent investigations in plant breeding, C. FRUWIRTH (*Jour. Landw., 56 (1908), No. 1, pp. 89–99*).—Brief summaries are given of some recent contributions to the literature of plant breeding. Most of the investigations reported were carried on in Germany, France, Austria, England, and Italy.

Reports of the plant culture stations in Denmark, 1905–6 and 1906–7 (*Separates from K. Danske Landhusb. Selsk. Aarsber., 1905–6, pp. 57–172; 1906–7, pp. 55–160*).—The reports contain summaries of trials conducted at various Danish State plant culture stations and accounts of other activities of the stations during the years given.

FIELD CROPS.

Thirty years of crop rotations on the common prairie soil of Illinois, C. G. HOPKINS, J. E. READHIMER, and W. G. ECKHARDT (*Illinois Sta. Bul. 125, pp. 323–356, figs. 8*).—This bulletin reports the results of rotation experiments in progress for 13 and 29 years under different systems of farming. The original experiment is described in a previous bulletin (E. S. R., 2, p. 559).

The average corn yields of the last 3 corn crops grown in different cropping systems in both series of experiments are given in the following table:

Average corn yields for the last 3 crops with different crop rotations.

Crop years.	Crop systems.	Average yield per acre.	
		13-year experiments.	29-year experiments.
		Bu.	*Bu.*
1905, 1906, 1907	Corn every year	35	27
1903, 1905, 1907	Corn and oats	62	46
1901, 1904, 1907	Corn, oats, clover	66	58

It was found that in 12 years of growing corn every year the yield became reduced from more than 70 bu. to 35 bu. per acre, and that during the next 16 years the decrease amounted to only 8 bu. During the first 11 years of the rotation of corn and oats the yield decreased from more than 70 bu. to 62 bu., and during the next 16 years a further reduction of 16 bu. occurred. In the 3-year rotation, during the first ten years the yield decreased from more than 70 bu. to 66 bu., and during the next 16 years to 58 bu., the average reduction being only ½ bu. per year.

In a system of grain farming a 3-year rotation of corn, oats, and clover was followed. The cornstalks were disked down and in harvesting the oats as much straw as possible was left in the stubble. The third year the clover was mowed once or twice and left lying on the land. If the clover seed crop was successful it was harvested and the clover straw returned to the soil. In addition, catch crops of annual leguminous plants such as cowpeas were grown between the corn rows. Special treatment was given some of the plats by applying lime at

the rate of ½ ton per acre of ground limestone, phosphorus for 6 years at the rate of 25 lbs. per acre per annum in the form of 200 lbs. of steamed bone meal, and a yearly addition of 42 lbs. of potassium in 100 lbs. of potassium sulphate. The cost per ton was about $2 for the limestone, $25 for the steamed bone meal, and $50 for the potassium sulphate.

Under the system of live stock farming all crops from the land as usually harvested were removed, including the corn and stover, oats and straw, and both first and second crops of clover. The amounts of manure applied were determined by the crop yields during the previous rotation, or the amounts of manure applied were such as could be produced in practice from the crops grown. A summary of the yields of the latest corn crops is given in the following table:

Average of three corn crops in the corn, oats, and clover rotation of thirteen-year experiments.

Crop years.	Special treatment.	Average yield per acre.	
		Grain farming.	Live stock farming.
		Bushels.	*Bushels.*
1905, 1906, 1907	None	69	81
1905, 1906, 1907	Lime	72	85
1905, 1906, 1907	Lime, phosphorus	90	93
1905, 1906, 1907	Lime, phosphorus, potassium	94	96

The results show in general that the fertility of the soil can be maintained or even increased by a proper system of grain farming with leguminous crops in the rotation, and that a good system of live-stock farming will also maintain the fertility of the land. It was observed that barnyard manure gave a net profit in the first 3 crops of $1.30 per ton, or of $7.80 an acre, when 6 tons had been applied. As an average of 18 tests with a rotation of corn, oats, and clover the use of 75 lbs. of phosphorus per acre produced increases in crop yields worth $12.39. Larger yields were secured and phosphorus was nearly twice as effective in the 3-year rotation of corn, oats, and clover as in the 2-year rotation of corn and oats. It is pointed out that while phosphorus is commonly the element that first limits the yield, nitrogen is lost from the soil so much more rapidly under poor systems of farming that this constituent soon becomes the limiting element, after which phosphorus alone has no power to increase the yield.

Field crops [at Copper Center Station in 1907], C. W. H. HEIDEMAN (*Alaska Stas. Rpt. 1907, pp. 53–58*).—In the tests with spring wheat varieties the most promising results were obtained with Early Riga and Velvet Chaff. Velvet Chaff or Blue Stem made the best growth but only a few heads matured, while Early Riga made only a fair growth but ripened uniformly. The most promising barley for future work in Alaska was Pamir No. 18922 from the Himalaya Mountains. Hanna Fall barley, sown April 27, made a good growth, matured, and was harvested August 15. Champion gave most satisfactory results as to yield of straw and grain and was next in earliness to Pamir. An attempt has been made to cross Pamir No. 18922 with Champion. Burt oats from station-grown seed nearly all matured by August 20. Finnish Black oats from station-grown seed produced its earliest matured heads August 15, and the entire field matured August 20, when it was cut for feed. Buckwheat was killed by frost July 4 and millet by frost in June. Wild rice was sown but none of the seed germinated this season. Of the winter grains, Amber winter rye was most resistant to winterkilling. The crop averaged 4 ft. in height.

About 11 acres are devoted to grasses introduced from the States. With the exception of smooth brome grass (*Bromus inermis*) and wheat grass (*Agropyron tenerum*) all have winterkilled badly and have run out. Wheat grass is the most promising of all the introduced grasses at the station. Timothy is not a success in that latitude. Seeds of 46 species of native grasses have been collected for thorough testing under farm conditions.

[Field crops at Rampart Station in 1907], F. E. Rader (*Alaska Stas. Rpt. 1907, pp. 43–47, pl. 1*).—Wheat, barley, rye, and oats were sown as winter grains on August 25, 1906, but the date of this seeding was too late for the latitude. For the first time in the history of the station winter rye failed to live through the winter and Kharkov wheat was the only winter grain to survive. Finnish Black oats, seeded May 24, was cut September 9. It reached an average height of 60 in., but the ground was too rich and the crop grew too tall and lodged badly. The growing season for Romanow wheat, seeded May 24, was about 10 days too short to bring it to maturity. A number of barleys from Abyssinia were grown this year for the first time and seem very promising. Of these, barley No. 362, seeded May 25, was ripe and was cut September 3, its average height being 36 in. A beardless barley, No. 12709, ripened its grain by September 3, but had a very brittle straw, so that when blown to the ground by a storm on August 1 it never straightened up again. Lapland barley this year ripened somewhat unevenly. Heretofore this variety has never failed to mature. Manshury barley has given the best results and has always ripened. This season it grew about 40 in. high and produced very plump heads of good length. Emmer and einkorn failed to mature.

Selected seed was grown of Lapland and Manshury barley and of Burt Extra Early and Finnish Black oats. Lapland barley reached a height of 60 in. and produced heads extra large and plump. The selected Manshury seed grew to a uniform height of 42 in. and the heads were fine and large. Both plats were harvested August 31. Burt Extra Early oats was harvested September 5. This variety has always ripened unevenly, but it is hoped that it may be improved by selection. Finnish Black oats grew to a uniform height of 48 in. and stood up perfectly. This variety is considered the best of those tested at the station.

Among the grasses under test, meadow foxtail (*Alopecurus pratensis*) has proved the earliest in maturity. This season it was ready to cut for hay July 1, when it had reached a height of 36 in. The seed was ripe July 20 and it was harvested for seed August 8. Orchard grass (*Dactylis glomerata*) did not head at all, and timothy (*Phleum pratense*) was also unsuccessful. Smooth brome grass (*Bromus inermis*) promises to be a good grass for hay in that region.

Early Rose potatoes yielded about ninefold and Burbank about eightfold. In yield and size the potatoes this year were inferor to last year's crop. The tubers keep perfectly in the winter.

Report of the Upper Peninsula Substation for the years 1905 and 1906, L. M. Geismar (*Michigan Sta. Spec. Bul. 41, pp. 3–40*).—Meteorological data for the 2 years are given in tables and the yields of different crops tested at the station are reported and discussed in detail.

The yields per acre of the most productive varieties in 1905 were as follows: Early Champion oats 47.5 bu., Mansheuri 6-rowed barley 35 bu., Dawson or Golden Chaff winter wheat 35.67 bu., French June field peas 41 bu., Northwestern corn 27.12 bu., Swedish Brown field beans 51.08 bu., Improved pea 29.04 bu., Earliest Navy bean 27.83 bu., Rye buckwheat 44 bu., broom corn or hog millet 48 bu., Northern Beauty potatoes 358.46 bu., Meyer Friederichswerth Elite sugar beet 37,600 lbs.

In 1906 the leading varieties and their yields were as follows: North Finnish S. P. I. No. 5513 oats 58 bu., Silsolsk No. 89 barley 35 bu., Velvet Chaff spring wheat 17 bu., Black English field peas 33.60 bu., Northwestern corn 68.06 bu., Swedish Brown field beans 43.17 bu., Rye buckwheat 25.83 bu., flax 10.30 bu., einkorn 29.04 bu., Dolsen potatoes 272.25 bu.

Potatoes planted November 5–9, 1904, sprouted and blossomed about 1 week earlier the following spring than potatoes of the same varieties planted May 18 and 20, 1905. A ¼ acre of fall planted potatoes yielded 3,390 lbs., as compared with 3,266 lbs. for a ¼ acre of spring planted tubers.

In 1906, on drained muck land these varieties of potatoes ranged in yield from 123.75 bu. to 284.62 bu. per acre, the leading variety being Northern Beauty. This same year a comparison of fall and spring planting on ⅛ acre plats again favored the fall planted crop in sprouting and blossoming. The yield on this area was in favor of spring planting by 369 lbs. In both years the average differences in yield between level and hill culture and in 1905 between spraying and not spraying were immaterial. In 1906, spraying with Bordeaux mixture gave an average increase at the rate of 22 bu. per acre. A sprayed plat of Delaware potatoes this same season yielded at the rate of 460.8 bu. per acre, while the unsprayed plat produced at the rate of only 358.4 bu.

Kherson oats stood second in 1905 with a yield of 40 bu. per acre. Burt and Sixty Day, two white varieties, and North Finnish, a black oat, are considered promising for that region. French Chevalier 2-rowed barley has given only low yields.

The results of a corn-breeding experiment in 1906 showed that corn will readily adapt itself to new environments and demonstrated the importance of breeding a type sure to ripen in all localities and in all seasons in the Upper Peninsula. Gehu has proved to be the earliest corn of 100 early varieties under test.

The yields of numerous forage crops are given in tables and the growth of these crops is briefly noted.

Forage crops in northwest Texas, A. B. Conner (*Texas Sta. Bul. 103, pp. 5–21, figs. 6, map 1*).—Cooperative forage crop investigations were begun by the Texas Experiment Station and the Bureau of Plant Industry of this Department in 1905 at Chillicothe, and in 1906 at Amarillo, in northwestern Texas, or that part of the State known as the Panhandle. Brief descriptions and cultural directions are given for the different forage crops tested.

Sorghum is by far the most important forage crop of this section. The best forage varieties, according to this report, are Sumac, Orange, Planter, Blackhull Kafir corn, Red Kafir corn, Red Amber, Minnesota Amber, and Milo maize. In 1907, a season not at all favorable to heavy forage production, medium early planting sufficiently thick and regular in the drill to allow the utilization of all available moisture gave the following yields at Chillicothe: Sumac and Orange 5 tons, Blackhull Kafir corn and Red Amber 4½ tons, Minnesota Amber and Planter 4¼ tons, Red Kafir corn 4 tons, and Milo maize 3 tons of thoroughly dried-out forage per acre. Careful seeding was found to control largely the growth and yield of the crop, and the use of a planter with a pack-wheel is recommended. Hand-thrashed seed was found more satisfactory than machine-thrashed seed.

The heaviest yields of forage with most varieties were obtained from drills 21 in. apart with stalks every inch in the drill. Milo maize gave the largest yield of forage in rows 42 in. apart with stalks every inch, and the best yield of seed in rows 3 ft. apart with stalks every 6 in. The yields ranged from 3 to 6 tons per acre at Chillicothe and from 3 to 8 tons at Amarillo.

Alfalfa promised to be valuable in the southeastern part of the section, but through the northwestern portion it had little promise except when grown in depressions known as swales, on beaches around lakes, and especially in canyons. Kansas and Texas grown seed gave the best results. Turkestan alfalfa has so far been a poor yielder.

The cowpea, which is valuable for rotation with sorghum, promises to take the place of alfalfa on the uplands. The moth bean compared favorably with the cowpea in yield of hay and was apparently more drought resistant. The soy bean and the mung bean did not give very satisfactory results.

Grains and forage crops for northern Wisconsin, R. A. Moore and E. J. Delwiche (*Wisconsin Sta. Bul. 161, pp. 3–23, figs. 5*).—The results secured with different grains and forage plants on the substation farms in northern Wisconsin in 1906 and 1907 are reported and discussed. It has been observed in general that the sandy soils of this region are especially adapted to growing sugar beets, corn, oats, soy beans, and clovers when well manured and a proper crop rotation is followed. The clay soils when well worked and drained are suitable for growing winter wheat, barley, oats, peas, clover, and mixed grasses. On heavy clay soil alsike clover has yielded as high as 8 bu. of seed per acre.

The early varieties of corn gave good yields on rich sand and clay loam soils, while the medium dent varieties produced an abundance of fodder but were too late for good yields of well-matured ear corn. Smut Nose and Yellow Flint matured well and seemed to be the preferable varieties for the region at present. Barley was profitable only on old well-subdued clay and loam soils. The heavy, bearded, stiff-strawed, six-rowed varieties have done best.

Wyoming forage plants and their chemical composition, H. G. Knight, F. E. Hepner, and A. Nelson (*Wyoming Sta. Bul. 76, pp. 119, figs. 50*).—These studies are in continuation of work previously reported (E. S. R., 18, p. 229). Of a total of 152 analyses of native and introduced forage plants grown in Wyoming, 72 are included in this bulletin. Heretofore the plants collected for the chemical work were all gathered at about an altitude of 7,000 to 8,000 ft., but for this bulletin the plants were collected from various altitudes ranging from about 4,500 to 11,000 ft.

It was found that the crude fiber in the Wyoming native grasses runs higher on an average than the crude fiber in eastern grasses, but apparently the variations in altitude alone have little or no effect upon this constituent and it is believed that when the crude fiber content is lower in forage grown at low altitudes other causes than altitude must operate to produce this general change.

The forage plants analyzed in general have shown a high percentage of nitrogen, averaging about 9 per cent of the water-free material when calculated as crude protein. Analyses made of soils show on the contrary a marked deficiency in nitrogen content. Thirteen grasses collected at elevations from 10,000 to 11,000 ft. contained on an average 4.85 per cent of ash, 2.64 per cent of crude fat, 32.32 per cent of crude fiber, 10.95 per cent of crude protein, and 49.24 per cent of nitrogen-free extract. This was very close to the average composition of forage plants collected at lower altitudes, but the crude protein was about 2 per cent higher. Downy oat grass, collected at 10,000 ft., contained 9.69 per cent of crude protein, while another sample collected at 11,000 ft. contained 12.20 per cent. Other samples are cited but the number of plants obtained at different altitudes is not considered large enough to warrant general conclusions.

A number of miscellaneous analyses, including analyses of grains, straw, and mixed hay, are also recorded.

Alfalfa studies, P. K. Blinn (*Colorado Sta. Bul. 128, pp. 3–7, pls. 5*).—The station has made a selection of seed from promising alfalfa plants and has established an alfalfa nursery containing 64 different varieties of promising

individual selections. This nursery was planted April 15, 1907, and thinned to single plants about the middle of July. An epitome of the first season's observations is given.

While in previous tests at the station the Turkestan alfalfa has proven the most desirable for hay, it was observed in these tests that although one-half of the plats were sown with Turkestan strains the most leafy and the greatest seed-producing plants were not found in the Turkestan varieties. Six selections of the most promising type for seed and hay were made, and of these the seed production in four ranged from 70 to 118 gm. from 10 plants, one strain produced 18 oz. of clean seed from 50 plants and the remaining strain 11 oz. from 150 plants.

Clover seed in the Connecticut market, E. H. JENKINS and MARY H. JAGGER (*Connecticut Sta. Bul. 160, pp. 3–14, figs. 3*).—This bulletin briefly reports the results of examining 51 samples of clover seed obtained from various sources within the State. The seed of 26 of the samples examined weighed less than 1½ gm. per 1,000 seeds, that of 2 weighing 1.27 gm. or less, being equal to about 363,000 seeds per pound. Two samples weighed 1.92 gm. per 1,000 seeds, which is equal to 236,000 seeds per pound.

The average vitality of the 51 samples was 86.6 per cent, but 20 fell below the minimum of 85 per cent and 4 below 75 per cent, the lowest being 64.2 per cent. The average purity of the seed was 90.5, which is 7.5 per cent lower than the provisional standard of this Department. Disregarding the foreign clover, alfalfa, and timothy seed present, 8 lbs. per acre of any of these samples would plant from 2 to 8 weed seeds per square foot of land.

Three samples were found highly adulterated, the first containing 21.2 per cent, the second 22.6 per cent, and the third 39.1 per cent of black medic (*Medicago lupulina*). In 5 samples the total number of foreign seeds per pound was 78,604, 54,705, 12,458, 28,237, and 44,522, respectively. Only 10 samples were apparently free of dodder seed. In 28 samples tested from 18 to 11,615 dodder seeds were found per pound. With a seeding of 8 lbs. per acre the smaller quantity of dodder would give 1 seed to every 300 sq. ft., while the larger quantity would average 2 dodder seeds for every square foot.

[Experiments in clover and corn selection], F. W. CARD (*Rhode Island Sta. Rpt. 1907, pp. 214–220*).—A test of purple and yellow seeds of red clover showed no material difference in average nitrogen content between the plants grown from the two kinds of seed, but striking differences in the nitrogen content of different individual plants varying from 2.86 per cent in the lowest to 4.62 per cent in the highest, or an increase of over 60 per cent, were observed.

In the corn selection experiments 6 rows of seed from plants bearing 13 ears in 1905 and 13 rows from plants bearing 11 ears in 1905 were planted May 24, 1906. The corn from the 13-ear seed gave an average of 21.3 oz. of ears per plant, 4.6 ears per plant, 3.1 good ears per plant, and with an average weight per ear of 4.6 oz. The corn grown from the 11-ear seed produced 15.6 oz. of ears per plant, 3.5 ears, and 2.3 good ears per plant, while the average weight per ear was 4.5 oz. The highest number of ears per plant borne in 1905 was 13 and in 1906 only 10, but the average number per plant increased. In 1905, 50 per cent of the plants bore less than 4 ears, and in 1906 only 27.5 per cent bore less than 4 ears.

Egyptian cotton in the southwestern United States, T. H. KEARNEY and W. A. PETERSON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 128, pp. 71, pls. 5, figs. 2*).—A review is given of the cotton trade of Egypt, together with a description of Egyptian cotton, and the results of experiments with this kind of cotton in Arizona are reported.

It is stated that the Colorado River region in southern Arizona and southeastern California, where the climate most nearly resembles that of Egypt, has proved to be well adapted to Egyptian varieties of cotton and that experiments in the Southwest, especially at Yuma, Ariz., during the last 5 years have demonstrated that good yields of high grade can be secured. At first the introduced plants made an excessive growth and produced relatively few bolls, but as the process of acclimatization progressed the plants were reduced in size, the average number of bolls greatly increased, they ripened much earlier and opened wide. Selection was also practiced in order to eliminate inferior individuals. The average length of the fiber of Mit Afifi, the principal variety, was less than 1⅜ in. and lacked strength, fineness, and uniformity as to the characteristic light brown color. In 1907 the length of fiber on the experimental field was practically 1½ in. and the quality had also improved. Two well-marked types were selected, one corresponding to Mit Afifi and the other to Jannovitch. The fiber of the first of these types is about 1½ in. in length, crinkly but fine, and of a pronounced brown color, while the second, which more nearly approaches Sea Island varieties, averages 1⅝ in. in length of fiber, which is silky, lustrous, and of a very light cream color. Mit Afifi yielded at Yuma in 1907 at the rate of 3,300 lbs. of seed cotton per acre, the percentage of lint being about 30. The crop was grown in rows 6 ft. apart and the plants 3 ft. apart in the row. In Egypt the rows average 32 in. apart and the hills 16 in. apart with 2 plants in each hill. The heavier growth in Arizona necessitates wider planting, but as the plants become acclimatized they will probably become smaller and the distance of planting may then be decreased.

Early planting has given much better results than late planting. A level seed bed with flood irrigation seems to be better suited to this section than the furrow method of planting and irrigation practiced in Egypt. The tap root of the plants on the loamy soils of the Yuma Valley penetrate from 6 to 8 ft. and consequently less water is required than for most crops under irrigation. It seems that in a rather light loam soil with the proper cultivation two irrigations after planting will produce a good crop. The fiber of the Egyptian cotton plants in the Colorado River region continues to ripen during several months and 3 or 4 pickings are necessary to harvest the bulk of the crop. Owing to the smaller size of the bolls picking is slower than with our large bolled Upland varieties. All other cultural processes are the same for both types. It is stated that one-fifth of the 600,000 acres of land ultimately to be under irrigation in the Colorado River region yielding 1 bale to the acre could produce the average amount of Egyptian cotton imported into the United States during the last 10 years.

How to make cotton growing pay, G. W. Carver (*Alabama Tuskegee Sta. Bul. 14, pp. 5–14, figs. 2*).—General directions for the profitable culture of cotton are given, and the advantages of special soil preparation are pointed out. The best results in a culture test were obtained on a plat plowed 9 in. deep and thoroughly pulverized by repeated plowing and harrowing until the soil was fine and mellow to that depth. A stalk of cotton grown on this soil had a splendid root growth and produced 12 mature bolls, while stalks on ground not prepared so deep had small root systems and matured fewer bolls.

To show the advantages of shallow surface cultivation, which produces a dust mulch and leaves the feeding roots undisturbed, the results of experiments with the sweet potato are pointed out. Sweet potatoes cultivated 2 in. deep gave much better results than those cultivated 5 and 6 in. deep. The meteorological records for 1906 and 1907 are reported, with brief comments.

Rice investigations: Report of first year's experiments, F. G. Krauss (*Hawaii Sta. Rpt. 1907, pp. 67–90, pls. 5*).—The rice industry in Hawaii is

briefly discussed and the plans, objects, and methods of the experiments reported are noted.

Of more than 100 varieties under test 11 have been selected as suitable for Hawaiian conditions. A number of these are upland rices producing a fair yield with a minimum moisture supply, and the others are promising wet land rices of the short, thick kernel type characteristic of Japan rice. Brief notes on some of these varieties are given. The results of a comparative study made between plats of several varieties are presented in the following table:

Comparison of standard Hawaiian Gold Seed, Japan Seed, and Egyptian varieties of rice.

Name of variety.	Station inventory number.	Date of sowing, 1907.	Date of maturity and harvest, 1907.	Growing period.	Height of plants.	Weight of paddy.	Weight of straw.	Estimated acre yields, paddy.
				Days.	*In.*	*Gms.*	*Gms.*	*Lbs.*
Standard Hawaiian Gold Seed.	148	Feb. 18	July 20	152	42	32	68	3,730
Hawaiian-grown Japan Seed..	153	...do	June 8	110	36	20	54	3,412
Hawaiian-grown Egyptian....	65	...do	July 20	152	48	43	114	4,129

It was found in this work that some varieties which yield well from July planting fail if sown in the early spring, or continue to vegetate until late fall, when they flower and fruit at about the same time as summer plantings. The all-season varieties are considered best for Hawaii. The spring varieties also produce fall crops, while fall varieties are not at all suited to spring culture.

With a view to discovering some of the fertilizer requirements of rice a series of 7 fertilizer experiments was begun July 1, 1906, and continued through a period of about 15 months. The first experiment was made with Hawaiian Gold Seed, and the results secured are summarized in the following table:

Summary of pot experiments with rice, showing effect of fertilizers on growth.

Series No.	Fertilizer used and calculated rate per acre.	Water transpired by 5 plants in total period of growth.	Green weight of 5 plants at end of 30-day period.	Water-free weight of 5 plants at end of 30-day period.	Water transpired per pound of water-free substance.
		Gms.	*Gms.*	*Gms.*	*Lbs.*
1	Check (no fertilizer)	202.0	1.92	0.42	480.95
2	Stable manure .....5 tons..	287.4	2.75	.60	479.00
3	Lime, air-slaked .....1 ton..	296.3	2.75	.57	519.82
4	Nitrate of soda.....200 lbs..	276.1	2.57	.57	484.38
5	Sulphate of potash .....200 lbs..	298.1	2.75	.57	522.98
6	Acid phosphate.....200 lbs..	276.7	2.57	.57	485.44
7	Nitrate of soda and sulphate of potash, 200 lbs. each	299.7	2.47	.60	499.50
8	Nitrate of soda and acid phosphate, 200 lbs. each.....	292.9	2.67	.57	513.86
9	Sulphate of potash and acid phosphate, 200 lbs. cach	235.1	2.37	.50	450.50
10	Nitrate of soda, sulphate of potash, and acid phosphate .....200 lbs. each..	314.6	2.67	.60	524.33
11	Nitrate of soda, sulphate of potash, and acid phosphate, 200 lbs. each, and lime, 2,000 lbs.	273.3	2.50	.55	496.91
12	Nitrate of soda, applied in 10 doses, 3 days apart .....200 lbs..	420.2	4.40	.95	442.10

The most striking result was the superior growth obtained where nitrate of soda was supplied in 10 equal doses, and the second important result was the apparent depreciation of the yield through the application of lime.

The object of the second experiment was to determine as far as possible by means of pot cultures the influence upon the yield of grain and straw of the various elements found in commercial fertilizers used in combination with and without lime. Japan variety No. 153 was used for the test and all fertilizers were mixed with the first 3 in. of soil before planting and applied at the rate of 50 lbs. per acre for each element. One of the striking results in this test was the general depression of the plants when treated with lime, the loss amounting to from 14 to 40 per cent. The general results of the test indicated that nitrogen in the form of sulphate of ammonia is especially suitable for the rice plant. The results with fish guano agreed closely with those obtained with sulphate of ammonia. Next to these two substances acid phosphate seemed to be the most available for the plant. The best combination of two elements was nitrogen and phosphorus in the form of sulphate of ammonia and acid phosphate or fish guano and acid phosphate. Where a complete fertilizer made up of the several forms of these different fertilizers was used practically all the plants were killed within a month.

The relative value of different fertilizers when applied to two widely different types of rice, the Hawaiian Gold Seed and Japan rice, was studied in a third experiment. The fertilizers were supplied in as varied selection as the market afforded and where single constituents were added 40 lbs. of nitrogen, 25 lbs. of phosphoric acid, and 45 lbs. of potash were supplied per acre. The data secured are brought together in the table below:

Relative value of the various commercial forms of nitrogen, phosphoric acid, and potash as fertilizers for the rice crop.

Fertilizers applied per acre.	Check (untreated).	Fertilized before planting.		Limed (750 lbs.) and fertilized before planting.		Fertilized after plants were three-fourths grown.	
	Paddy.	Paddy.	Gain or loss.	Paddy.	Gain or loss.	Paddy.	Gain or loss.
	Lbs.	*Lbs.*	*Per ct.*	*Lbs.*	*Per ct.*	*Lbs.*	*Per ct.*
Nitrate of soda, 266 lbs	3.54	4.76	+ 25.92	3.18	−15.87	5.06	+33.33
Sulphate of ammonia, 200 lbs	3.66	7.12	+ 88.36	3.37	−10.84	5.34	+41.27
Sulphate of potash, 95 lbs	3.93	10.15	+168.52	2.87	−24.07	2.90	−23.27
Sulphate of potash and magnesia, 180 lbs	3.81	9.06	+139.68	3.75	− 0.79	3.47	− 8.20
Acid phosphate, 125 lbs	4.02	8.75	+131.48	2.15	−43.12	4.59	+21.42
Reverted phosphate, 156 lbs	3.90	6.31	+ 66.93	2.06	−45.50	3.12	−17.46
Thomas slag phosphate, 156 lbs	4.26	5.56	+ 47.07	2.75	−27.25	3.12	−17.46
Complete fertilizer (nitrate of soda, acid phosphate, and sulphate of potash), 350 lbs	3.75	4.75	+ 25.66	3.12	−17.46	3.70	− 2.11
Complete fertilizer (sulphate of ammonia, fish guano, reverted phosphate, and sulphate of potash), 350 lbs	3.66	7.55	+ 99.73	3.37	−10.8	3.57	− 5.55
Complete fertilizer (nitrate of soda, Thomas slag phosphate, and sulphate of potash and magnesia), 350 lbs	3.30	3.94	+ 4.23	3.00	−20.63	4.31	+14.02

The average production of the 10 untreated plats was 3.78 lbs. of paddy. In a second experiment in which the Hawaiian Gold Seed variety was grown the results were almost identical with those given in the table above.

Plat tests were carried out in a fourth experiment with Japan seed rice fertilized with Chinese peanut cake, fish guano, stable manure, and commercial fertilizers. On some plats lime was used, and as in practically all other tests the addition of this substance seemed to depress the yield except on the plat receiving stable manure at the rate of 5 tons per acre. Fish guano and commercial fertilizer showed a decided gain in the application made before the crop

was sown as compared with the application after the crop had become well advanced. Little difference in this regard was observed with Chinese peanut cake. Stable manure showed an increase of 121 per cent of paddy for an application of 2½ tons, while an application of 5 tons per acre yielded 250 per cent increase over the check plat and over 100 per cent more than where only half as much manure was used. Stable manure also greatly increased the yield of straw in proportion to the amount of grain. Fish guano, which stood next, gave an increased yield of 118 per cent over the check plat, followed by the commercial fertilizer with an average gain of 100 per cent when applied at the rate of 100 lbs. per acre. The same treatment upon the Gold Seed variety produced about the same results.

The object of the fifth experiment was to compare the relative value in economy of several complete fertilizers under different modes of application. The fertilizers were applied April 30, 1907, when the crop was about half grown. The application in one instance was made up of fish guano, acid phosphate, and sulphate of potash and magnesia, and in another of nitrate of soda, sulphate of ammonia, acid phosphate, and muriate of potash. These compounds were used alone, and the one first mentioned was also given in combination with sulphate of ammonia. Where the compound containing the guano was worked into the ground to a depth of several inches a gain of 58.5 per cent, equivalent to a net profit of $29.60 per acre, was obtained, and where the fertilizer was not worked into the ground an increase of 42.5 per cent, representing a net profit of $20.75, was secured.

In the sixth and seventh experiments, conducted in conjunction with the experiment just described, two special nitrogen fertilizing tests were undertaken on a field scale. Sulphate of ammonia at $72 per ton was applied at the rate of 75 and 100 lbs. per acre, and nitrate of soda at $55 per ton at the rate of 100 and 150 lbs. per acre. The applications were made at the same time when the plants were a little more than half grown. The sulphate of ammonia from the 75 and 100 lbs. applications showed increases of 80 and 85 per cent, or net profits of $35.15 and $36.50 per acre, respectively. The larger application barely paid for the extra cost, as compared with the use of 75 lbs. per acre. The 100 lbs. application of nitrate of soda produced a gain of 21 per cent, or a net profit of $12 per acre. These results between the two forms of nitrogen are in practical agreement with those secured in the pot experiments.

The results of culture experiments with reference to age of seedlings at time of transplanting and to broadcasting, drilling, and transplanting are presented in the following tables:

The yield of Japan seed rice (No. 153), as influenced by age of seedlings at time of transplanting.

Experiment No.	Age of seedlings at time of transplanting.	Date of transplanting.	Date of flowering.	Date of maturity and harvest.	Yield from three 100-square feet cuttings.		Relative yields, experiment 1 taken as 100.	Calculated yields per acre.		Value of paddy per acre.[a]
					Paddy.	Straw.		Paddy.	Straw.	
					Lbs.	*Lbs.*		*Lbs.*	*Lbs.*	*Dollars.*
1	20 days old....	Mar. 22	May 8	June 10	29.00	27.75	100	4,205	4,024	105.12½
2	25 days old....	Mar. 27	....do...	....do...	25.50	24.50	87.93	3,697	3,553	92.42½
3	30 days old....	Apr. 1	May 6	....do...	22.25	22.50	76.72	3,126	3,263	78.15
4	35 days old....	Apr. 6	May 5	....do...	13.25	18.00	45.69	1,921	2,610	48.02½
5	20 days old (fertilized)..	Mar. 22	May 9	....do...	32.50	48.00	112.07	4,713	6,960	117.82½

[a] At $2.50 per 100 pounds.

Relative yields from broadcasted, drilled, and transplanted Japan seed rice (No. 153.)

Experiment No.	Method of culture.	Date of germination.	Date of flowering.	Date of maturity and harvest.	Height of plants.	Average number of fruiting culms per plant.	
						Primary.	Secondary.
1	Seed broadcasted, harrowed in 1 to 2 inches deep, and flooded	Mar. 2-5	May 1-5	June 6	*Inches.* 23-24	2-3	1-2
2	Seed drilled in 1 to 2 inches deep (rows 12 inches apart) and flooded	....do...	....do...	....do...	25-28	2-3	1-2
a3	Seedlings 20 days old at transplanting	Mar. 2	May 8-10	June 10	32-34	6-8	1-3
a4	Seedlings 35 days old at transplanting	....do...	May 3-5	....do...	20-22	2-4	1-2

Experiment No.	Method of culture.	Yield from three 100 square foot cuttings.		Calculated yields per acre.		Value of paddy per acre.[b]
		Paddy.	Straw.	Paddy.	Straw.	
1	Seed broadcasted, harrowed in 1 to 2 inches deep, and flooded	*Lbs.* 12.25	*Lbs.* 17.95	*Lbs.* 1,776	*Lbs.* 2,501	*Dollars.* 44.40
2	Seed drilled in 1 to 2 inches deep (rows 12 inches apart) and flooded	13.50	15.50	1,958	2,393	48.95
a3	Seedlings 20 days old at transplanting	29.00	27.75	4,205	4,024	105.12½
a4	Seedlings 35 days old at transplanting	13.25	18.00	1,921	2,610	48.02½

[a] Taken from preceding table. [b] At $2.50 per 100 pounds.

Topography of the sugars and nonsugars in the sugar-beet root, J. URBAN (*Ztschr. Zuckerindus. Böhmen, 32 (1907), No. 1, pp. 17–24, figs. 2*).—Different parts of the beet root were found to vary not only in sugar content and in crude ash but also in the composition of the pure ash. The organic and inorganic nonsugars increased from the lower toward the upper portion of the root, but the rate of increase was not the same for all substances. In the fresh material, the smallest quantity of potassium oxid was found in the middle portion, while phosphoric acid was about equally distributed throughout the root. The ash from the lower part contained the largest quantities of potassium oxid and phosphoric acid, but these substances decreased toward the crown. Sodium oxid, lime, and chlorin decreased from the crown toward the tip.

A study of the concentric parts of the beet showed that the sugar content is highest and the nonsugars are lowest in the middle portion, that the inner portion contains less sugar, and that the lowest percentage of sugar is found in the youngest layer next the skin. Sodium oxid and chlorin were lowest and calcium oxid, potassium oxid, and phosphoric acid were highest, in the outer portion.

Plant food requirements of seed beets, mother beets, and cuttings, K. ANDRLÍK, J. URBAN, and V. STANĚK (*Ztschr. Zuckerindus. Böhmen, 32 (1907), No. 1, pp. 1–17, figs. 2*).—The composition of seed beets in the early stages of growth, at the time their stems develop, during blossoming and seed formation, and at maturity was determined, and the contents of the different elements at these various stages are recorded and discussed. The results of analyses are given in the table on the following page.

Composition of seed beets in different stages of development during the second year of growth.

Date.	Average weight.	Dry matter.	Sugar.	Reducing substances.	Pentosans.	Total nitrogen.	Albuminoids.	Ash.
Root:	*Gms.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Mar. 27	358	25.67	18.25	0.21	2.23	0.197	0.730	0.502
May 29	348	16.82	9.20	.15	1.99	.147	.500	.688
June 15	410	16.45	6.90	.17	2.21	.185	.530	.951
July 6	452	14.77	5.60	.22	1.96	.156	.440	1.156
July 31	473	15.25	4.80	.23	2.21	.164	.680	1.189
Aug. 15	476	14.79	4.80	.32	2.14	.174	.610	1.208
Leaves and fruit:								
May 29	500	9.79	.23	.70	.87	.395	1.970	1.651
June 15	538	13.01	.34	.55	1.11	.609	3.110	2.068
July 6	863	17.87	.45	.43	1.57	.610	2.960	2.212
July 31	830	27.72	.17	.90	3.58	.696	3.530	2.821
Aug. 15	66	89.34	.23	.05	5.94	1.771	8.660	13.094
Stems:								
June 15	425	17.50	1.60	1.47	2.86	.291	1.220	1.827
July 6	463	23.58	.71	.88	4.97	.252	1.190	1.761
July 31	461	25.62	.32	.20	5.13	.254	1.300	2.333
Aug. 15	153	96.65	.75	.25	18.25	1.198	5.450	8.356
Seed: Aug. 15	188	86.56	.55	.15	12.84	1.865	9.230	4.616

An experiment in Swedish turnip culture, F. W. Card (*Rhode Island Sta. Rpt. 1907, pp. 265–273, pls. 10*).—The results of this experiment indicated that the turnip grows best on a garden soil which is sandy rather than silty or clayey. Lime was not beneficial except on a humus soil. Commercial fertilizers increased the tops more than the growth of the roots. Potash was the most advantageous ingredient and when combined with phosphoric acid gave better results than any other combination of commercial fertilizers. The use of sulphate of ammonia gave but a slight increase in yield, and the use of nitrate of soda and dried blood gave no beneficial results. Barnyard manure gave an excellent total yield, but scab was more prevalent than where commercial fertilizers were used. Ashes showed no increase in root growth but apparently increased the growth of the tops about 50 per cent. A moderately dry soil gave better yields than a very wet one. Lime was beneficial when applied with the commercial fertilizers.

HORTICULTURE.

[Horticultural investigations in Alaska], C. C. Georgeson, R. W. De Armond, F. E. Rader, and C. W. H. Heideman (*Alaska Stas. Rpt. 1907, pp. 21–25, 31–41, 47–49, 50–53, 74–87, figs. 3*).—Notes are given on the varieties of fruits, ornamentals, and vegetables being tested at the Sitka Station, fruits and vegetables at the Rampart Station, and vegetables at the Copper Center Station. More than 12,000 fruit trees and shrubs, as well as a large amount of seed, were sent to various parts of the Territory, and the results secured with some of these lots are given in letters from several of the stations' cooperators.

At the Sitka Station, where the work with fruit is more advanced, the Hyslop and Yellow Transparent apples bloomed during the past season, but bore no fruit. These varieties, together with the Whitney crab and the Peerless, give considerable promise. Other varieties are doing poorly. It appears certain that only the so-called summer varieties can mature in Alaska, since in the interior the season is too short, and in the coast region the summers are too cool to mature fall and winter apples. The experiments also indicate that dwarf trees are likely to succeed best.

Of the four varieties of cherries growing, the Early Richmond and English Morello are the best. Currants, gooseberries, and raspberries do well in Alaska. The Cuthbert raspberry has done particularly well in the coast region. The

Downing and Houghton gooseberries have been fairly successful at the Sitka Station, but the Whitesmith, a large English variety, excels them all. Crosses of cultivated varieties of raspberries and strawberries with native varieties are being tested. A native black gooseberry and several native currants have been brought under cultivation.

Trees and plants suffered considerable damage from upheaval during the winter of 1906–7.

Report of the horticulturist, J. E. HIGGINS (*Hawaii Sta. Rpt. 1907, pp. 52–60, pls. 2*).—The chief work of the year consisted in experiments in the shipping of tropical fruits, already noted (E. S. R., 19, p. 338).

The orchard area has been increased by about 4 or 5 acres. In addition to avocados and mangoes, the newer orchard plantings include oranges, pomelos, lemons, papaias, sweet sop (*Anona squamosa*), sour sop (*A. muricata*), cherimoya (*A. cherimolia*), Kafir plum (*Harpephyllum caffrum*), *Spondius lutea*, guava (*Psidium guajava*), and the star apple (*Chrysophyllum cainito*). About 1 acre has been planted to mulberries for experiments in the production of food for silkworms.

Brief descriptive notes are given of the star apple, the fruit of the Anona group, the carambola (*Averrhoa carambola*), which is a Chinese fruit furnishing a drink similar to lemonade, and *Carica quercifolia*, which species of Carica is said to be much richer in papaine, or "vegetable pepsin," than the papaia.

The cultivation of roselle was continued and experiments conducted in the manufacture of jam and jelly. The receipts used are here given. There appears to be nothing gained in planting roselle seed earlier than February in the region of Honolulu. Seed planted before this date produced plants which bore prematurely but did not produce the main crop earlier than plants which were started later. Although the roselle does not require the richest soil, correspondingly better results are secured on good soils. In the experiments conducted at the station the yield averaged from 6,000 to 7,000 lbs. per acre.

The Natal pineapple being tested at the station fruited during the year and is believed to be identical with the Queen. This variety, while not adapted for canning, is of fine quality and may prove of value in markets where a small fruit is demanded.

Report of the South Haven Substation for 1906, L. R. TAFT and F. A. WILKEN (*Michigan Sta. Spec. Bul. 40, pp. 3–37*).—This is the regular annual report of the South Haven Substation, consisting chiefly of brief cultural and descriptive notes on the varieties of strawberries, gooseberries, currants, raspberries, blackberries, cherries, peaches, plums, grapes, pears, apples, crab apples, quinces, and nuts being tested, in connection with which lists are given of cherries, plums, grapes, pears, and apples recommended for planting.

The attempt to grow the English walnut has met with failure thus far. The pecan has made a vigorous growth, but has not yet fruited. The Japanese walnut (*Juglans sieboldiana*) bore a small crop containing many undersized nuts. The trees appear to be failing. Both the Kentish Cob and the Cosford Thin Shell filberts are thrifty growers, but are not productive enough for commercial purposes, although desirable for home use. The chestnuts, of which Paragon is considered the best variety, are the most promising, although the Japanese varieties have failed to fruit.

A test was made between paper and wooden boxes as carriers of strawberries, gooseberries, and currants. The wooden box was found to be superior in picking and packing the fruit and was the one desired by the trade, as the paper boxes were not considered firm enough to stand rough handling. There is little difference in the cost, but the paper box is more attractive. It is suggested

that it may be used for a special trade where care is taken in handling the fruit.

In addition to comparative tests of the various remedies for the San José scale, which have been previously reported (E. S. R., 19, p. 56), cooperative experiments in spraying for the second brood of codling moth were carried on. The plats were injured by the freeze of October 10, thus destroying the chance of getting accurate results, but the evidence secured indicates that the spraying should be done by August 1. It is recommended that in orchards infested with the codling moth the trees should be sprayed with arsenate of lead either the latter part of July or early in August. With varieties subject to the attack of apple scab the addition of Bordeaux mixture is advised.

[Report on horticultural crops of the Upper Peninsula Substation for the years 1905 and 1906], L. M. Geismar (*Michigan Sta. Spec. Bul. 41, pp. 42–59*).—Cultural and varietal notes with tabular data in some instances are given of peas, beans, sweet corn, cucumbers, squashes, pumpkins, muskmelons, onions, tomatoes, radishes, spinach, lettuce, cabbage, celery, pepper, tobacco, and kale, together with several herbs, honey plants, and ornamentals grown at the station in 1905 and 1906. Similar notes are given for strawberries and orchard fruits.

Report of the horticulturist, F. García (*New Mexico Sta. Rpt. 1907, pp. 31–46*).—An outline of the work of the year with data on variety tests of sweet potatoes and the cost of producing sweet potatoes and chillies. The newer work includes variety tests of apples and strawberries, a study of the life history of the codling moth and a test of the lime-sulphur-wash for the San José scale in that region, investigations relative to the best time to plant strawberries and onions, and fertilizer and close-planting celery tests.

The 3 best sweet potatoes relative to yield were the Polo, Fullerton Yellow Yam, and Brazilian. In 1906 on a one-half acre plat of sweet potatoes, the total cost, inclusive of hauling the crop and growing the sets in the cold frame, was $40.67. The total yield was 10,809 lbs., which were sold for $159.36. Partial data are given on similar work with sweet potatoes and chillies for 1907.

Report of the horticultural division, F. W. Card (*Rhode Island Sta. Rpt. 1907, pp. 211–214, 220–265, pls. 7*).—The results for the year are given of various cultural and breeding experiments, including further data on the market garden rotation and lawn experiments (E. S. R., 18, p. 1125).

A large number of crosses have been made between different varieties of raspberries and blackberries during the past years. Some general notes are given on a few of these which are considered promising.

The breeding of beans with a view of increasing their frost-resistant power was continued and the results to date are given. To determine what progress has been made in increasing the hardiness of the beans, seed of the same varieties included in the work was obtained from a seedsman in 1907 and planted with them. From the data obtained the conclusion is reached that this is not a promising line of plant breeding.

Further observations are given on the condition of the various plats in the lawn experiments in which the effects of fertilizers leaving an acid residue and those leaving an alkaline residue are being compared with fertilizers having a neutral effect on the soil. Seven different grasses and grass mixtures were used in this comparison. On other plats different proportions and combinations of fertilizers are being tested, together with special grass mixtures offered by seedsmen.

In the market garden rotation experiment, in which the value of stable manure is being compared with chemicals combined with cover crops, potatoes and early cabbage were used for the early crops, which were followed by beets and

carrots on the ground occupied by early cabbage and by turnips and cabbage on the ground first occupied by potatoes. A detailed account is given of the work together with the results secured. Taking the crops as a whole, the yields from chemicals supplemented by cover crops were equal to those obtained from stable manure. The potatoes were the only crop which gave a slightly larger yield from stable manure. Similar work was continued with onions, spinach, and lettuce in 1907. The season was cold and backward, however, and only the spinach germinated promptly. The spinach grew decidedly quicker on the chemical plats, as may be expected in a cool season unfavorable for the action of the soil organisms in the stable manure.

A test was made of different methods of planting muskmelons with the particular object of seeing whether it was possible to grow a crop in spite of the melon blight. The ground was plowed early in May and lime applied and harrowed in at the rate of 1 ton per acre. The experimental plat was divided into 3 sections. In the first 2 sections stable manure was placed in the partly filled furrows, which were then ridged up, and in section 3 the manure was placed in the bottom of the furrow, after which the soil was leveled off. Seeds were sown on parts of each section and the remainder was planted with potted plants. The tabular results show that the largest melons were obtained from the transplanted plants, and that a larger proportion were obtained somewhat earlier. A better yield was also obtained from the section in which the manure was placed in the bottom of the furrow and covered, leaving the ground level, than from the sections in which the melons were grown on ridges. The number and average diameter of mature and green melons found on each section at the end of the season are given. Taking equal length of row, the yield showed 637 melons from transplanted plants and 799 from seed plants. The transplanted plants, however, were set 2 ft. apart in the row, while the seedling plants were much closer. Blight appeared upon the melons about the end of August and the vines were given 4 successive sprayings a week apart with Bordeaux mixture. Compared with the behavior of melon plants elsewhere the same season, spraying appeared to hold the blight somewhat in check.

Detailed notes were made on the strawberries in fruit during the season. Descriptions and scales of points are given for a few of the most promising seedlings. Very few of the named varieties gave satisfactory yields. The Gowen Seedling and Latest were the best.

An attempt has been made for several years to improve the production of strawberries by selecting and breeding from the most productive parents. A summary is given of the results since 1899. The results have not been satisfactory, however. "The difficulties which have appeared have seemed to more than offset the possible advantage which might accrue by always selecting the most productive parents."

To determine if possible the influence of using scions procured from bearing trees of known quality and productiveness, a number of Northern Spy trees were planted in the spring of 1898 and top grafted in the following year with selected scions of Rhode Island Greening. Comparisons will be made when the trees come into fruiting with ordinary nursery grown trees. Other tests with apples are also being conducted to determine the influence of stock upon scion, and a summary is given of the work to date.

Records are given of the blooming periods of several varieties of apples, pears, peaches, and plums in the station orchard for the years 1904, 1905, and 1907, together with brief notes upon a few varieties of peaches which have fruited on the college grounds. Notes are also given on several miscellaneous breeding experiments with fruits.

Observations were made in the autumn of 1906 on the college vineyard posts, which were variously treated in 1903 with a view of adding to their durability (E. S. R., 16, p. 59). The posts treated with carbolineum were making the best showing. In some cases the outside surface was still quite firm. Charred posts and those treated with coal tar ranked next in their condition and were equally well preserved. Very little difference could be detected in the treatments with pine tar, lime, or copperas and lime. The outer wood ring was more or less decayed in all cases and in the untreated posts was entirely gone. No difference was noted between the posts set with the top end down and those with the bottom end down.

Northern Spy trees were planted in 1898 with a view of testing the influence of methods of pruning at planting time upon the subsequent growth. The trees planted included 2-year whips, 2-year branched trees trimmed to a whip when set, 2-year trees with branches cut back one-half and the leader untouched, 2-year trees untrimmed, and trees with the roots untrimmed, cut back half, and cut back by the Stringfellow method, leaving only a mere stump. In the 3 latter lots the branches were cut back about one-half, leaving the leader untouched. Trees were also planted by the Stringfellow method with the roots cut back to a mere stump 1 or 2 in. long, and the tops cut back to a stub about 1 ft. long. Very little difference has resulted from the different methods of treatment, except in the case of the untrimmed trees cut back to whips when set, in which the tendency has been to develop a tall, leggy growth with small tops. The trees which were not trimmed at all when planted are in good shape, and the results seem to indicate that in the moist Rhode Island climate no more trimming is desirable for apple trees at planting time than is necessary to enable the tree to start into growth well.

The cultivation and handling of goldenseal, Alice Henkel and G. F. Klugh (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 6, pp. 19, figs. 7*).—A revision of Bureau of Plant Industry Bulletin 51, pt. 6 (E. S. R., 16, p. 747), dealing with the identification and geographical distribution of goldenseal, the conditions under which it grows, the collection and preparation of the root, the cultural requirements, and the yield of roots. The question of supply and demand and the possibilities of goldenseal as a cultivated crop are also discussed.

An analysis of roots grown for 6 successive seasons by the Department showed a hydrastin content of 2.98 per cent, whereas the Pharmacopœia calls for only 2.50 per cent. Cultivation appears to influence the hydrastin content principally in the development of a normal high percentage of healthy well-nourished roots.

Marketing the muskmelon, J. W. Lloyd (*Illinois Sta. Bul. 124, pp. 295–322, figs. 15*).—The results are here given of studies conducted by the station for several years relative to the marketing of muskmelons. Consideration is briefly given to the market demands with reference to types of melons and packages, together with a detailed account of the most approved method of handling the crop, including picking, grading, packing, construction of packing sheds, and the organization of the working force. The various methods of selling the crop are also discussed.

Notes on Brassica crosses, A. W. Sutton (*Gard. Chron., 3. ser., 43 (1908), No. 1100, pp. 58, 59, figs. 9*).—Extracts from a paper on this subject read before the Linnean Society, January, 1908, with illustrations and descriptions of various crosses made.

The author commenced a series of experiments in 1900 to determine to what extent different members of the Brassica family could be seeded close to one another without danger of crossing. Various forms of *B. oleracea* were grown side by side and many nondescript hybrids were secured, the majority of which

were discarded as of no practical value. A few, including a Brussels sprout with cabbage head, a curled leaf thousand-headed kale, and a thousand-headed kale with large tender leaf stalks are being perpetuated.

Subsequent attempts to cross various types of *B. oleracea* with different forms of rape, swede, and turnip (*B. napus*, *B. campestris*, and *B. rapa*, respectively) by artificial pollination and under closely controlled conditions lead the author to conclude that *B. oleracea* (cabbage type) will not cross outside of its own class. In cases where the hybrids produced seed, they split up in the second generation into forms resembling the types first cross-fertilized and other intermediate forms.

The rapes, swedes, and turnips crossed with each other and produced hybrids, many of which failed to produce seed, hence were not perpetuated. The deduction is made that as it seems impossible to perpetuate hybrid forms between white and yellow swedes, white and yellow turnips, white turnips and swedes, yellow turnips and swedes, or vice versa, it is probable that these types do not owe their existence to a common wild form.

How new fruits can be made by crossing, S. W. Fletcher (*Gard. Mag. [New York]*, 7 (*1908*), *No. 3, pp. 142–146, figs. 13*).—In this popular article the author aims to present the opinions relative to crossing and the exact methods of practice adopted by the majority of the leading plant breeders in this country. Although the article deals with the crossing of orchard fruits, many of the methods described are considered applicable in the crossing of other plants.

Horticultural districts of the State, G. A. Marshall et al. (*Ann. Rpt. Nebr. Hort. Soc., 38 (1907), pp. 20–34, map 1*).—The Nebraska State Horticultural Society recently divided the State into 19 horticultural districts. A map is given showing these districts, together with a revised list of orchard and small fruits and ornamentals recommended for planting in each.

Fall and early winter injuries to orchard trees and shrubbery by freezing, A. D. Selby (*Ohio Sta. Bul. 192, pp. 129–148, figs. 9*).—Numerous examples of injury to orchard trees and ornamentals from freezing during the fall and winter of 1906–7 were found over the whole State, with the exception of the lake shore district where little damage was done. This bulletin contains a discussion, together with results of studies made relative to the nature and extent of the injury.

The trees and shrubs seriously injured included the apple, Japanese plum, sour cherry, peach, raspberry, weigela, privet, English walnut, and arborvitæ.

The losses were most conspicuous with apple orchards 5 years old or under, and varied considerably with different varieties. In the northern section of the State the Baldwin and in the southern section the Rome Beauty and the Hubbardston suffered severely, the injury in some cases amounting to 90 per cent or more of the young trees. The principal damage is attributed to the October freeze of 1907, which was preceded by a long spell in which the temperature and moisture conditions were above the normal, thus favoring a vigorous growth late in the season. Some damage was also done by warm midwinter weather together with low minimum temperatures. No evidence was secured to show the advantage of one method of orchard practice over another as a means of warding off such winter injury. The loss, however, is regarded as unusual both in time of its occurrence and in the severity with which certain types of trees were injured. The heavy losses with standard commercial varieties suggest the possibility of growing these sorts on hardier stocks.

It is believed that secondary effects upon apple trees injured by freezing may be observed for several years, and observations are to be made along this line.

Second contribution to the experimental study of the forcing of grafted American grape stocks, A. Drago (*Secondo Contributo Sperimentale allo Studio*

della Forzatura Degli Innesti di Viti Americane. Rome, 1908, pp. 72, figs. 20).—An account is given of the work conducted in the propagation and grafting of cuttings of American grape stocks at the experiment grounds of the Royal Agricultural Institute during the season 1907. The various phases considered include the storing of stocks and scions, treatment of the wood previous to grafting, storing of grafted vines previous to forcing, description of the grafting operation, methods of stratification, forcing, planting, and subsequent treatment.

The tropical plants of commercial importance, E. de Wildeman (*Les Plantes Tropicales de Grande Culture. Brussels, 1908, vol. 1, pp. VIII+390, pls. 22, figs. 64*).—This is the first volume of a second edition of this work (E. S. R., 14, p. 870), now revised and enlarged to two volumes.

In the present volume consideration is given to the botany, regions of culture, statistics, preparation, and in some cases the composition of coffee, cacao, vanilla, cola, and bananas. In the opening chapter a brief description is given of the flora of tropical Africa, together with biographical notes on the different botanists who have contributed to the knowledge of the vegetation of the Congo Free State.

Volume 2 is to deal with the rubber-producing plants of tropical Africa.

The date sugar palm (Phœnix sylvestris), N. N. Banerjei (*Dept. Agr. Bengal, Quart. Jour., 1 (1908), No. 3, pp. 161–164*).—A brief account is given of the methods of cultivating and tapping the date sugar palm in Bengal. According to the data here given, the total yield of date sugar for the province is about 15.6 per cent of its total yield of cane sugar.

Ether and the germination of seeds, J. Taubenhaus (*Cornell Countryman, 5 (1908), No. 6, p. 201, fig. 1*).—Tabulated results are given of an experiment conducted to determine the effect of ether on the germination of old and new seeds. The process of etherization was similar to that used by the author in his work with bulbs (E. S. R., 18, p. 938). The seeds tested included tomato, turnip, cucumber, muskmelon, asparagus, cabbage, and wheat.

The conclusion is reached that the ether treatment appears to put new life into old seeds, since, while about half of the old seeds sown germinated when etherized, only about one-third of the check seeds of the same kind started. Etherization appeared to hasten the germination of all the seeds tested. Seedlings from etherized seeds were stronger than those from untreated seeds. The experiment was conducted both in a medium temperature house and in a hothouse with a temperature of 75° F. As no results were secured in the medium house it is concluded that a hot-house temperature is necessary for this process.

A handbook for planning and planting home grounds, W. H. Manning (*North Billerica, Mass., 1907, pp. 74*).—This handbook is issued by the Talbot Mills for the use of its tenants, with a view of creating an interest in the improvement of their premises. In addition to brief practical suggestions relating to the planning and planting of home grounds, a catalogue is given of both wild and garden flowers, shrubs, vines, trees, fruits, and vegetables, including their common and botanical names, and brief notes on their characteristics.

A classified list for ready reference is also given showing herbs, shrubs, trees, and annuals adapted for varying light, soil and moisture conditions, differences in height, climbing, creeping, and thorny plants, and plants with edible fruits. An index is also given of the common names of wild plants, together with localities in which they may be found growing in Billerica.

Laws of Massachusetts relating to public shade trees (*Woodland and Roadside, 6 (1908), No. 8, pp. 89–95*).—The text is given of all the laws relating to shade and ornamental trees, and especially highway trees, which were in force up to January 1, 1908. This supplements a pamphlet on laws relating to Massachusetts forest lands previously noted (E. S. R., 19, p. 545).

FORESTRY.

Forest economy, G. Huffel (*Economie Forestière. Paris, 1904, vol. 1, pp. IX+419; 1905, vol. 2, pp. XIII+484; 1907, vol. 3, pp. VIII+510, figs. 155*).—In this work the author has aimed to bring together both the historical and present information from various sources pertaining to the different phases of forest economy. Each volume consists of a series of detached studies.

Volume 1 deals at length with forest products, influences, ownership, legislation, policy, history, and statistics. The first study in volume 2 is a treatise on dendrometry. Succeeding studies deal with the rôle of man, natural agencies, and forest capital in the development of forests, the relations between capital and revenue, forest estimates and valuations, with a concluding chapter on usufruct and its relations to forestry. The third volume deals with various phases of forest management, including the history and development of different systems of management and methods now in use. Although the work deals primarily with French forestry conditions, much of the subject-matter is of interest to foresters in general.

State forestry development, F. W. Rane (*Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 129–135*).—In this paper the author discusses the Massachusetts forest policy, with the view of demonstrating what it is hoped will prove a practical State forestry development.

Contribution to the forest statistics of Alsace-Lorraine (*Beitr. Forststatis. Elsass-Lothringen, 1906, No. 25, pp. 127*).—Statistical data are given for the forest year 1906 relative to operations in the state, domain, and public forests of Alsace-Lorraine. The data deal with forest areas, yields in timber and minor products, yields from various species, sylvicultural and improvement operations, expenses, returns, etc. Summarized comparative data are also given for the period from 1870 to 1906.

Forestry in the provinces of Malaga, Grenada, Jaen, and Cordova (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 1, pp. 26–30*).—A brief account by the French consul at Malaga of forest conditions in the above provinces, including their constitution, range, kinds of wood, utilization, returns, and commerce.

Annual progress report on forest administration in the lower provinces of Bengal for the year 1905–6, W. H. Lovegrove (*Rpt. Forest Admin. Bengal, 1905–6, pp. 55*).—This is the customary progress report of the various forest operations for the year 1905–6, including alterations in areas, forest surveys, protection, etc., construction of working plans, sylvicultural operations, and exploitation, together with a financial statement for the year. The important features of the report are presented in tabular form.

Fire conservancy in Burma, F. B. Bryant (*Indian Forester, 33 (1907), No. 12, pp. 537–549, pls. 4*).—In this paper the author presents considerable tabulated data to show that the long continued protection of forests from fire although improving the soil, has tended to cause the younger tree growth to decrease, owing to the heavy growth of bamboos which thrive under fire protection and kill out young teak and other valuable light-demanding species. A classification is given of the teak forests in Burma, and it is suggested that fire conservancy be abandoned in those forests which are overrun with bamboos until young teak growth is established.

Economic thinning of white pine, A. F. Hawes (*Forestry Quart., 5 (1907), No. 4, pp. 368–372*).—The author gives a statement of results secured from improvement thinnings recently made in an 8-acre white pine woodlet in Connecticut. The woodlot is described, and tabulated data are given showing the nature of the stand on representative surveys. The trees were about 50 years

old and averaged 292 to the acre, alive and dead, whereas the average number of trees per acre in a New England white pine grove of this age is estimated at 400. In the improvement thinnings made, 51,800 ft. of lumber and 35 cords of wood were removed, which netted the owners $354.55, or $44.32 per acre. From the data given it appears that after cutting, about 200 trees per acre were left standing.

Condition of cut-over longleaf pine lands in Mississippi. J. S. HOLMES and J. H. FOSTER (*U. S. Dept. Agr., Forest Serv., Circ. 149, pp. 8*).—This circular, which is based on a study of the forest conditions of Mississippi recently jointly conducted by the Forest Service of this Department and the Mississippi State Geological Survey, contains a brief survey of the conditions of cut-over lands in the longleaf pine regions of that State, together with suggestions for the improvement of these lands.

Owing to the wasteful lumbering methods, together with destruction by fire following lumbering, more than half the longleaf pine land of the State has been converted into a blackened and barren waste. It is estimated that the supply in the State will be practically exhausted within a quarter of a century.

Some data are given to show that where fire is kept out, natural reproduction of the pine forests is a comparatively simple process, and the conclusion is reached that the first step in the solution of the problem of reforesting waste cut-over longleaf pine land is to provide a law which shall not only prevent fire, but shall carry with it adequate provisions for its strict enforcement. A statement is given of the provisions which such a law should include.

Mexican timber. A. B. BUTMAN (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3088, pp. 9–12*).—According to data here given there are from 20,000,000 to 25,000,000 acres of first-class timber in Mexico. The heaviest stands of pine and oak are found in the States of Chihuahua, Durango, Jalisco, Michoacan, and Guerrero, and are said to compare favorably with similar stands in this country as regards quality, diameter, and length of clear body. In addition to the open pine stands there are said to occur some 25 varieties of hardwood not well known to the lumber markets. Descriptive notes are given of the wood of many of these varieties, together with data on the chicle industry, transportation developments, rating and prices of wood, cost of logging and manufacturing, and statistics of the lumber trade with the United States for the years 1905 and 1906, and a list of wholesale prices of American lumber f. o. b. Mexican City.

Austria's wood industry and lumber trade. A. VON ENGEL (*Österreichs Holz-Industrie und Holzhandel. Vienna, 1907, vols. 1, pp. X+374; 2, pp. VI+402, pls. 9, figs. 213*).—This work consists of technical, economic, and statistical information for manufacturers in the various wood using industries, lumber dealers, foresters, etc.

In volume 1 an account is given of the methods of exploiting timber in the different regions of Austria, including felling operations, methods of transportation, and the utilization of lumber in the sawmill and factory and in the various industries. Methods of wood preservation are described and a list is given of schools offering courses in the various wood working industries.

Volume 2 gives an account of the local wood industries in different parts of Austria, specifications for the preparation of lumber for various government purposes, numerous considerations relative to the lumber trade, and statistical data relative to forests, lumber production, and the lumber trade in various parts of Austria.

A treatise on the commercial uses of wood, A. MATHEY (*Traité d'Exploitation Commerciale des Bois. Paris, 1906, vol 1, pp. XVIII+492, pls. 8, figs. 377; 1908, vol. 2, pp. XV+835, figs. 429*).—Volume 1 of this work, which was published in 1906, treats of the properties and qualities of wood, conservation, storage, and preservative treatment, methods of exploitation, and transportation.

The present volume contains a detailed account of the uses of wood in various commercial industries, including its use for fuel and for the manufacture of charcoal, paper and fiber, the industries using small sizes of wood, round, unbarked, and square timber, girders, railroad ties, sawed and cleft wood, various small forestry industries, and many other general uses to which wood is put, together with accessory products such as tannin, resin, dyes, wood alcohol, etc.

The arboretum of the National School of Streams and Forests, A. JOLYET (*Rev. Eaux et Forêts, 47 (1908), No. 3, pp. 70–79*).—The arboretum is briefly described and a list is given of the species under observation showing their origin, together with notes on the hardiness of several exotic species.

The evergreen trees of Colorado, B. O. LONGYEAR (*Colorado Sta. Bul. 130, pp. 3–32, figs. 26*).—This bulletin is presented with the view of familiarizing the people of Colorado with the native evergreens of that State and of strengthening the interest in their protection. Keys and descriptions of the Colorado genera and species of evergreens are given, together with suggestions and directions for their use as ornamentals, wind-breaks and screens. The descriptions are accompanied by a series of plates showing the distinguishing characteristics of the various species. Of the 13 evergreens occurring in Colorado which grow to the stature of trees 10 belong in the pine family.

Notes on the bamboos of Indo-China, CREVOST (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 68, pp. 872–893, figs. 4*).—In these notes a general account is given of the various forms of bamboos growing in Indo-China, including their characteristics, range, habitat, and methods of propagation, with descriptive notes by the author and others of the various species and their uses. The local names only are given in most cases, owing to the imperfect botanical classification of the bamboos.

The chestnut tree, J. B. LAVIALLE (*Le Châtaignier. Paris, 1906, pp. III+286, pl. 1, figs. 11*).—Part 1 of this work treats of the botanical and historical classification and description of the chestnut genera and principal species, together with a historical and botanical study of the common and improved varieties of chestnut trees. Succeeding portions deal with the culture and exploitation of chestnut groves, utilization of the wood and other products, the use of the chestnut in ornamental horticulture, revenues from chestnut groves, enumeration of the flora occurring in chestnut groves, insect pests, diseases, and their remedies.

Karité, argan, and some other African sapotaceous trees possessing fatty seeds, E. PERROT and A. CHEVALIER (*Vég. Utiles Afrique Trop. Franç., 1907, No. 2, pp. 194, figs. 32, map 1*).—A botanical, scientific, and economic study of the karité tree (*Butyrospermum parkii*), the argan tree (*Argania sideroxylon*), and other less known African trees of the sapotaceous family possessing fatty seeds. The work consists of extracts from numerous contributions on this subject, together with the scientific observations and botanical investigations of the authors.

Special attention is given to the karité, which abounds in Central Africa. The fruit of this tree yields a butter-like substance which is eaten extensively by the natives and also imported to Europe in considerable quantities under the name of shea-butter and used in the manufacture of soap. Although the coagulated gum is nearly identical in its appearance with gutta-percha, the conclusion is reached that it is of no economic value as a substitute. The argan,

which appears to grow only in Morocco, furnishes an oil similar to olive oil and the wood of the tree is very hard and durable.

The text is accompanied with a map showing the geographic distribution of karité, together with numerous illustrations of the flower parts, fruit, cross-sections of seeds, etc., of the different trees described.

Teak wood, M. Büsgen, C. C. Hosseus and W. Busse (*Tropenpflanzer, Beihefte, 8 (1907), No. 5, pp. 343–399, figs. 11, dgms. 2, map 1*).—This is a series of three papers on teak wood, as follows: The properties and production of Java teak or Djati, by M. Büsgen, an account of the exploitation of teak wood in Siam, by C. C. Hosseus, and an account of teak reforestation in the African colonies, by W. Busse.

Growing wattle bark, R. H. Millward (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3087, pp. 4–6*).—A brief account is given of the wattle bark industry in South Africa, including methods of culture, preparation for market, yields, etc.

Willow culture in Holland, E. Hesseling (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijv. en Handel, 1907, No. 6, pp. 37–92, figs. 7*).—An account of willow culture in Holland, including general data relative to the importance and extent of the industry, climate, soil, and varieties, together with a description of the extensive and intensive methods of growing 1-year and 3 and 4-year shoots, planting on sandy bottoms, insect pests, and fungus diseases attacking willow wood and their remedies, raw products, and industries.

Several appendixes deal with an account of basket-making and the weaving schools in Austria by E. D. Van Dissel, numerous statistics and graphical diagrams relative to areas devoted to willow culture, yields, prices, etc., and a bibliography on the subject of willow culture.

An effective screen for nurseries, E. J. Zavitz (*Forestry Quart., 5 (1907), No. 4, p. 367, pl. 1*).—An illustrated description is given of a simple and cheap form of screen used for shade in evergreen seedling work in the government nurseries at the Ontario Agricultural College. This screen is made in a fence picket machine out of 4 ft. lath woven with 6 strands of wire. As compared with the old method of nailing lath on frame these screens are much more easy to handle and are considerably cheaper.

The cultivation of Ficus elastica, C. Bald (*Calcutta, 1906, pp. 32, pls. 4*).—This pamphlet is compiled from various periodicals and publications on rubber culture, with a view to assembling in compact form the present information on the plantation culture of *Ficus elastica*. Successive chapters deal with natural conditions, suitable lands, and methods of propagation, planting, culture, and tapping. Some of the methods of culture here recommended are said to be based upon the author's personal experience.

Hevea guyanensis in Surinam, W. A. Van Asbeck (*Inspectie Landb. West-Indië, Bul. 9, pp. 1–27*).—A brief account of the exploitation of this species of rubber, including its botany, tabulated data on tapping experiments with the "V" cut, herring-bone, and spiral methods, and the preparation of the rubber for market.

A new [rubber-producing] forest species of Tonquin, P. Eberhardt (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 65, pp. 576–585, figs. 4*).—A botanical description is given, together with notes on the habitat, methods of exploitation, and production of latex and rubber of a rubber-producing tree occurring in the mountain region of Tonquin and locally known as Teo-Nong. An analysis of the latex gave 67.6 per cent rubber. It is believed that this species, under modern methods of exploitation, may become of great importance.

Recent observations on the rubber-producing tree of Tonquin (Teo-Nong), P. Eberhardt and Bloch (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 67,*

pp. 798–803, figs. 13).—A further botanical study, with illustrations of the floral organs, is given of the rubber-producing tree described by the author and noted above. The tree is said to belong to the ulmaceous family and to be a new species of the genera Streblus de Loureiro.

Recent analyses made of the rubber of this tree show a rubber content of 71.61 per cent. The results are also given of the analyses made of the rubber from the creeper *Bousigonia tonkinensis*, showing the content of rubber to be 77.34 per cent.

DISEASES OF PLANTS.

A contribution to the biology of wood-destroying fungi, Caroline Rumbold (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 2, pp. 81–140, pl. 1, figs. 25*).—A contribution is given to the life history of a number of wood-destroying fungi, the studies including species of Merulius, Polyporus, Dædalea, Coniophora, Agaricus, Lenzites, and Schizophyllum. Pure cultures have been made of the various species, and their growth, characteristics, fruiting bodies, reaction to substratum, etc., are described.

Parasitism of Melampyrum pratense, L. Gautier (*Rev. Gén. Bot., 20 (1908), No. 230, pp. 67–84, figs. 21*).—A study has been made of *M. pratense*, which is a semiparasitic plant that is quite specialized in its parasitism. Its preference is for the roots of forest trees, especially the beech, the roots of which are well furnished with mycorrhiza.

The germination of the seed and method of attack were studied at considerable length. The author found that the parasitic state was quickly assumed, the haustoria appearing on the rootlets even before the reserve material in the seed had been used up or the cotyledons had fallen. The truly nonparasitic phase of the life of this plant is very short, although not entirely wanting.

On the existence of Myxomonas betæ, J. Trzebinski (*Ztschr. Pflanzenkrank., 17 (1907), No. 6, pp. 321–334*).—A critical review is given of the work and conclusions of Brzezinski, in which it is claimed that *M. betæ* is the cause of a number of diseases of the sugar beet, among them a root rot of the seedlings, a dry rot of the leaves, and a hypertrophied condition of the roots. The author claims that his studies, made under carefully controlled conditions, have failed to substantiate the conclusions of Brzezinski, and that the reputed new organism does not differ in any way from *Pseudocommis vitis* of Debray.

A study of Aspergillus flavus, D. Brocq-Rousseu (*Rev. Gén. Bot., 20 (1908), No. 231, pp. 102–110, pl. 1*).—In continuation of his studies on the alteration of cereals by various molds (E. S. R., 19, p. 47), the author reports finding *A. flavus* very common on grains, especially on maize. A study was made of this fungus, and its character of growth in various media is described, as are also its morphological and biological characters.

The author found that the fungus varied considerably in its coloration, that it had the power of digesting albuminoid materials, that it secreted amylase, and that it had pathogenic properties. The pathogenic properties of the fungus are to be described in detail in a future publication.

Distorted barley heads, D. von Hegyi (*Ztschr. Pflanzenkrank., 17 (1907), No. 6, pp. 334–337, figs. 2*).—Descriptions are given of distorted heads of barley in which the awns were twisted and matted together and the heads did not fully emerge from the leaf sheath. Two forms of this disease are recognized, one caused by *Siphonophora cerealis*, the other by *Helminthosporium gramineum*.

Dry rot of corn, T. J. Burrill and J. T. Barrett (*Illinois Sta. Circ. 117, pp. 3*).—According to the authors, dry rot of corn is responsible for losses which in

the aggregate are very large. The most common form of dry rot disease is that caused by the fungus *Diplodia maydis*.

Ears infected with this fungus shrivel, darken in color, and become light in weight. The kernels are also shriveled, very brittle, and loosely attached to the cob. The fungus penetrates all portions of the ear, producing many dark brown spores, which serve to propagate it.

There are several other forms of dry rot which are more or less important, some of which at least are due to species of Fusarium.

In the case of the Diplodia disease, and probably the others, the fungus perpetuates itself over winter on old diseased ears and old stalks. It is recommended that all diseased ears be collected and burned, and that where fields are infected to any considerable extent the stalks be deeply plowed under or burned. If the first suggestion is adopted and the second followed wherever necessity demands it, according to the authors, serious losses will be practically prevented.

Diseases of the peach, E. Foex (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), Nos. 5, pp. 134–141, pl. 1; 6, pp. 167–170*).—Descriptions are given of some of the diseases to which the peach and allied plants are subject, with suggestions for their control. Among those described are gummosis, peach leaf curl, a disease caused by *Asterula beyerinckii*, peach powdery mildew, and peach rust.

A spot disease of potatoes, N. H. Swellengrebel (*Arch. Néerland. Sci. Exact. et Nat., 2. ser., 13 (1908), No. 1–2, pp. 151–198, pls. 8*).—A disease of potatoes is described in which the tubers when cut exhibit brownish spots arranged in a circle, corresponding to the distribution of the fibrovascular bundles. About the discolored areas a layer of cork cells is formed. Later the tissues break down, and often cavities are formed within the tubers. When the tubers are fully developed there is no further spread of the cork areas if the potatoes are kept in dry, well-aired places.

No fungi were found associated with the diseased spots when subjected to microscopical examination, but on cultures 3 bacteria were obtained from the diseased tissues: *Bacillus megatherium*, *B. vulgatus*, and *B. mesentericus*. In addition *Bacterium punctatum* was isolated from the cavities. These bacteria are common soil organisms that appear under certain conditions to be able to attack the tissues of the potato. Inoculations with them produced pronounced cork formations, and in some instances there developed a dry form of rot, in others a wet rot.

The different manifestations exhibited by this disease have led to its being confused with other diseases, and the author claims that this accounts for its infrequent mention. He states that the cavities in the tubers are caused either by *Acrostalagmus cinnabarinus* or *Bacterium punctatum*. In the latter case it often results in a wet rot of the tubers.

As precautionary measures for preventing this disease it is recommended that the soil should be well limed, that planting should not be done on infested soils, and that the tubers should not be cut before planting. In order to prevent the destruction of the tubers in the storehouse, they should be kept in cool, dry places and not in pits.

A Fusarium disease of potatoes, O. Appel (*K. Biol. Anst. Land. u. Forstw. Flugbl. 42, pp. 4; Min. Bl. K. Preuss. Verwalt. Landw. Domänen u. Forsten, 4 (1908), No. 2, pp. 51–55, figs. 2*).—A description is given of a Fusarium disease of potatoes, the most striking characteristic of which is the rolling of the leaflets. These roll in toward their midribs and assume a yellowish color. When the attack is late in the season or not very severe but little loss in the crop will be found, but at other times the tubers are so reduced in size that the

yield is very materially diminished. Diseased tubers show discoloration when cut across, and all such should be rejected in planting. The disease is not a new one, but it has only lately become prominent.

A leaf spot disease of sisal in German East Africa, K. Braun (*Ber. Land u. Forstw. Deutsch-Ostafrika, 3 (1908), No. 4, pp. 143–166, pl. 1*).—In 1905 a peculiar spotting of sisal leaves was reported, and in 1906 the author visited a number of plantations and found the spotting more or less common in all localities.

The trouble seems to be due to high temperature and weather conditions, no plant or animal parasite being found to be associated with it. It appears that under certain conditions the sun burns the tissues of the leaves, and that later sunken, discolored areas appear, due to the destruction of the underlying tissues. All leaves do not seem to be equally subject to the spotting, those standing most nearly vertical being less injured than the spreading ones. The author was able by artificial means to produce the spotting without any action of the sun. As would be expected from the nature of the cause, the underside of the leaves is less subject to injury than the upper.

The smuts of sorghum, E. M. Freeman and H. J. C. Umberger (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 8, pp. 9*).—A description is given of the sorghum smuts, 2 forms of which are recognized, the grain, or kernel, smut (*Sphacelotheca sorghi*) and the head smut (*S. reiliana*).

The grain, or kernel, smut is easily distinguished by the fact that only the individual kernels, or grains, are affected, while the head retains its usual form and nearly its usual appearance.

The head smut is quite different in appearance. The whole head just as it emerges from the upper leaf is converted into a single large smut mass, covered by a whitish or grayish membrane, which soon bursts and sets the spores free. In this smut all trace of the individual grain is lost, and the smut mass resembles somewhat that of a smut mass on corn.

Of the 2 forms of smut, only the kernel smut is at present widely distributed, and experiments have shown that this can be readily controlled by treating the seed either with formaldehyde or hot water. Copper sulphate has also given satisfactory results, but is not to be preferred to either of the other treatments.

The head smut at present is known to occur in abundance only in a restricted area in the Panhandle region of Texas, and the only recommendation that can be made at the present time is to keep it away from the farm and the community. In order to do this, care must be exercised to obtain seed from regions where the head smut does not exist.

So far as now known, milo maize has not been reported as subject to either disease, and it may probably be safely grown without treatment.

The field treatment of tobacco root rot, L. J. Briggs (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 7, pp. 8*).—During the past few years a root rot of tobacco, due to *Thielavia basicola*, has been reported from the tobacco districts of Kentucky, Connecticut, Ohio, and Wisconsin (E. S. R., 16, p. 886; 18, p. 1139). The root rot has been successfully checked in the seed bed by the use of formalin and through steam sterilization, but neither of these means is practicable for its control under field conditions. The author carried on some preliminary experiments with fertilizers which seemed to indicate that tobacco is much more severely injured by the fungus in the fields where the soil has been made alkaline by the long-continued use of large amounts of lime, ashes, and fertilizers containing carbonate of potash.

By field and greenhouse experiments it was found that the alkaline condition of the soil favored the development of the root rot, and as a remedy it

is suggested that no lime be used on diseased fields, but that potash be applied in the form of sulphate of potash or double manure salts. Phosphoric acid in the form of acid phosphate or dissolved bone may be used to correct the alkalinity of the soil. Where other land is available for tobacco, diseased fields should be rotated with some other crop.

Investigations on the susceptibility of various varieties of wheat to smut, O. Kirchner (*Fühling's Landw. Ztg., 57 (1908), No. 5, pp. 161–170*).—The results are given of an investigation on a large number of varieties of spring and winter wheats to determine their susceptibility to smut (*Tilletia tritici*).

In connection with this investigation the cause of the resistance was studied, particular attention being paid to the claim that in different varieties a relation exists between their susceptibility and their germinative energy. The author failed to find that a low germinative energy was in any way associated with a strong inclination toward infection by smut, and a high germinative energy was not an unfailing character for the determination of the resistance against this disese.

Wheat nematodes (*Schweiz. Samen Untersuch. u. Versuchsamt. Zürich, Flugbl., 1907, No. 1, pp. 2, figs. 2*).—An account is given of a nematode disease of wheat caused by *Tylenchus tritici*. The presence of the nematode is indicated by a distorted growth of the wheat and the appearance in the heads of swollen and distorted grains.

Where nematodes are believed to be present, it is recommended that the seed wheat should all be submerged in water and the distorted grains rising to the top skimmed off. Where only a slight occurrence of nematodes is noticed the infected plants should be pulled out of the field in the early spring.

So far as known this species of nematode occurs only on wheat, no other plant being subject to its attack.

A contribution to the knowledge of cutting bed fungi, W. Ruhland (*Arb. K. Biol. Anst. Land u. Forstw., 6 (1908), No. 1, pp. 17–76, figs. 3*).—A description is given of *Moniliopsis aderholdii* n. sp. found on cuttings of asparagus, begonia, Tradescantia, etc., in the cutting beds.

A disease of globe artichokes, L. Trabut (*Bul. Agr. Algéria et Tunisie, 14 (1908), No. 2, pp. 35–37, fig. 1*).—A description is given of a disease of globe artichokes which is due to a species of Ramularia.

The infected plants have their inner scales darkened and often more or less rotted. The parasite has not been found in the decayed tissues, but cultures have shown the presence of 2 species of bacteria. It is probable that they are associated with the rotting and follow the injury by the fungus.

Spraying with Bordeaux mixture or some similar fungicide, if done sufficiently early in the season, it is believed would prove efficient in holding this disease in check. The spraying, however, should be discontinued in time to allow the fungicide to be washed from the heads.

A disease of lettuce due to Marsonia panattoniana, O. Appel and F. Laibach (*Arb. K. Biol. Anst. Land. u. Forstw., 6 (1908), No. 1, pp. 28–37, pl. 1*).—A description is given of a serious disease of lettuce that made its appearance in the spring of 1907 and caused great loss to the crop in certain parts of Germany.

The cause of the disease was found to be the fungus *M. panattoniana*, a description of which is given. By means of culture experiments the fungus was isolated and the disease was reproduced by inoculations.

For the control of the disease the author recommends the destruction of all diseased plants, care of the seed beds, spraying the plants in the seed bed, and the rotation of crops, so that lettuce should not follow where a diseased crop of the same plant has been previously grown.

[Apple diseases in Kentucky], H. GARMAN (*Kentucky Sta. Bul. 133, pp. 62–69, pls. 14*).—Notes are given on the occurrence and characteristics of apple twig blight, bitter rot, blotch, brown rot, scab, leaf spot, leaf rust, crown gall, and hairy root, with suggestions for their control where definite means are known.

A disease of olives due to Cylindrosporium olivæ n. sp., L. PETRI (*Ann. Mycol., 5 (1907), No. 4, pp. 320–325, figs. 5; abs. in Bot. Centbl., 107 (1908), No. 10, p. 248*).—According to the author, for the past 2 years there has been prevalent in Tuscany a disease of the olive fruit which resembled in some ways a disease in Portugal caused by *Glœosporium olivarum* and in other ways a disease in Dalmatia due to the fungus *Macrophoma dalmatica*. A study of the fungus, however, showed that it was distinct from either of these and apparently an undescribed species, to which the author has given the name *Cylindrosporium olivæ* n. sp. A technical description is given of the fungus and its effect upon the host.

Yellows and some other important diseases of the peach, J. L. PHILLIPS (*Va. Crop Pest Com. Circ. 4, n. scr., pp. 12, figs. 9*).—The author gives an account of the distribution of peach yellows and some other peach diseases in Virginia, describing their symptoms and methods for control. For peach yellows, peach rosette, and little peach the means for control consist of digging up and destroying the affected trees. In addition an account is given of peach leaf curl, due to *Exoascus deformans*, for the prevention of which thorough spraying with Bordeaux mixture is advised.

Cacao pests of Trinidad, O. W. BARRETT (*Proc. Agr. Soc. Trinidad and Tobago, 7 (1907), pt. 10, pp. 281–304*).—This is a report to the agricultural society of the author's observations regarding the fungus and insect pests of cacao, with some notes upon miscellaneous crops.

The principal destruction of cacao appears to be due to the fungus Lasiodiplodia, although a species of Fusarium, *Phytophthora omnivora*, and other fungi were noted as rather common upon the fruits. A number of insect pests are reported, the most destructive of which is the black and white beetle (*Steirastoma depressum*), the larval stage of which burrows in the trunks and larger branches.

For preventing the fungus diseases, the author recommends the pruning out of all diseased material, which should be burned or deeply buried, and treating the areas cut with some antiseptic. In addition he recommends better attention to cultivation, shade, wind-breaks, pruning, etc.

Cranberry diseases in Wisconsin, C. L. SHEAR ([*Proc.*] *Wis. Cranberry Growers' Assoc., 21 (1908), pp. 17–21*).—According to the author, the scald, rot, and anthracnose, the 3 most injurious fungus diseases of the cranberry in the East, while present in Wisconsin, are not causing very serious loss. Those diseases which are known to be most destructive in the Wisconsin cranberry meadows are Sclerotinia disease, blossom blight or blast, and a disease that is called by some growers false blossom.

The Sclerotinia disease is characterized by the attack of the fungus on the young shoots just as the plants are beginning to blossom. The tips wither and the fungus produces a soft, white, mold-like growth on the stem and leaves. It later attacks the fruit until it is nearly mature without any external evidence of the presence of the fungus. At picking time the diseased berries show a grayish, more or less wrinkled condition of the skin, and the whole berry becomes gray and shriveled. So far as known, it is in these affected berries that the disease is carried over the winter, and all such fruit should be burned or deeply buried.

The blossom blight or blast attacks the young fruit about the time the blossoms fall. The primary cause of the disease is believed to be either a general lack of vigor of the vines or an exhausting of the fruiting power of the plants by excessive stimulation and growth. This disease may be held in check by the sanding of the bogs, a practice commonly followed in the East, or by cutting and thinning the vines by the use of the knife rake. It is believed that better attention to the water supply would also reduce the loss due to this cause.

The false blossom is probably due to a disturbance of the physiological functions of the plant, brought about by abnormal conditions of growth and an excessive amount of nitrogenous plant food. It is characterized by the production of abnormal flowers, the sepals, petals, and stamens of which are frequently changed into leaves or leaf-like bodies. The reduction of the water supply, accompanied by pruning of the vines and liberal sanding of the marshes, it is believed will prevent loss from this cause.

Some diseases of strawberries, F. Laibach (*Arb. K. Biol. Anst. Land u. Forstw., 6 (1908), No. 1, pp. 76–80, figs. 3*).—The author describes diseases of the strawberry caused by *Marsonia potentillæ*, *Leptothyrium macrothecium*, and *Zythia fragariæ* n. sp.

A pine disease (*Bd. Agr. and Fisheries* [*London*], *Leaflet 199, pp. 3, fig. 1*).—A disease of pine trees is described which is due to the fungus *Diplodia pinea*. The disease is confined to terminal shoots and is recognized by the yellowing and subsequent shedding of the leaves, followed by the death of the shoots, which die back for a distance of 6 to 10 in. The dead shoots are persistent, and commencing with the year following infection furnish a crop of spores each season which infect other shoots. Experiments conducted at Kew show that within 2 months after infection the leaves become yellow and begin to twist themselves, due to desiccation, and that at the expiration of 4 months all the leaves have fallen and the shoot is dead.

Inoculation experiments were carried on in which spores were placed on 3-year-old plants of white pine, Scotch pine, spruce, silver fir, and larch. In every instance where the surface of the young shoots was unbroken the spores failed to infect the plant, but where the spores were placed on a drop of moisture that extended from a minute puncture in the bark, they set up an infection which resulted in a dense growth of mycelium, followed by yellowing and falling of the leaves. Successful inoculations were made in the case of the 2 species of pine, but no infection occurred on spruce, fir, or larch.

It is believed that the fungus infects the plants through the action of insects, and this point is to be investigated further.

In the case of nursery stock and young trees the removal of all dead shoots would tend to check the spread of the disease to a considerable extent.

A disease of pine twigs, L. Petri (*Ann. Mycol., 5 (1907), No. 4, pp. 326–332, pl. 1; abs. in Bot. Centbl., 107 (1908), No. 10, p. 248*).—The author describes a disease of young pine trees, in which the terminal branches are destroyed. The cause of the disease is said to be *Cytosporella damnosa* n. sp. and it resembles in some respects a disease of firs due to Cytospora and one of hemlock caused by *Fusicoccum abietinum*.

The fungus has been cultivated and inoculation experiments performed, in which it was found that the spores readily infected the young twigs where they had become injured by any mechanical means. Where there was no previous injury there seemed to be no infection.

Witches' brooms of Pinus sylvestris, K. Müller (*Naturw. Wchnschr., 23 (1908), No. 9, pp. 134–136, figs. 3*).—A description is given of a number of striking forms of witches' brooms that have been observed occurring on *P. syl-*

vestris. The cause of these malformations appears to be unknown, but thus far no fungus hyphæ have been recognized in any of the tissues.

Fungusine as a smut preventive, D. McAlpine (*Jour. Dept. Agr. Victoria, 6 (1908), No. 1, pp. 35, 36*).—An account is given of a comparative trial of Fungusine, a commercial product that is claimed to be more efficient than either copper sulphate or formalin for the prevention of smut of cereals.

When tested it was found that copper sulphate was 100 times more effective than Fungusine in the prevention of stinking smut, and that formalin when used at less than half the strength usually recommended was 30 times more effective.

An analysis of the material is given, from which it appears that it consists principally of burnt lime, white arsenic, and crude carbolic acid.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report of the ornithologist, H. A. Surface (*Penn. Dept. Agr. Bul. 154, pp. 55–59*).—Unfavorable conditions are said to have caused the death of large numbers of bluebirds which had migrated north rather prematurely. Brief mention is made of the food of a number of the birds of Pennsylvania, including hawks, owls, woodpeckers, grouse, crow, bluejay, chickadee, etc.

The lizards of Pennsylvania, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1907), No. 8, pp. 233–264, pls. 4, figs. 3*).—An analytical key is presented for the determination of the species of lizards found in Pennsylvania. Brief notes are given on the habits of these lizards with particular reference to their food and economic relations.

Synopsis of studies in metazoan parasitology in McMane's laboratory of pathology, University of Pennsylvania, A. J. Smith (*Univ. Penn. Med. Bul., 20 (1908), No. 12, pp. 262–282, pls. 10*).—Statistical data are given regarding the occurrence of trematodes, cestodes, nematodes, and other parasites in various animals. The anatomy of some of the parasitic worms was carefully studied and is described in connection with illustrations.

The rôle of arthropods in pathology, G. Marotel (*Ann. Soc. Agr. Sci. et Indus. Lyon, 1906, pp. 279–302, figs. 12*).—The author discusses the agency of mosquitoes, biting flies, and ticks in the transmission of protozoan diseases to animals and man.

International catalogue of scientific literature. L—General Biology (*Internat. Cat. Sci. Lit., 5 (1907), pp. VIII + 141*).—An author and subject catalogue is given of literature in the field of general biology published mainly in 1905, but also to some extent during the years 1901–1904.

Report of the entomologist, D. L. Van Dine (*Hawaii Sta. Rpt. 1907, pp. 25–51, pls. 2, figs. 3*).—A record is given of the routine work of the entomologist in the investigation of injurious insects during the year under report. There is a relatively large amount of insect injury in Hawaii due to the facts that cultural methods of control are little practiced, that sugar cane is the chief crop and offers a large and continuous food supply for insects, that there are no climatic changes to prevent the development of insects, that diversified farming and crop rotation are little practiced, and that many injurious species have been introduced without their natural parasites.

The sweet potato weevil was found on the island of Maui in 1907 and has caused considerable injury. The destruction of the infested crop is recommended for controlling this pest. Attention is also called to the unusually serious outbreaks of the melon fly and fleas. The life history and habits of the melon fly are described together with recommendations for the control of this pest. In cases of bad infestations of fleas it has sometimes become necessary to mow the lawn close, burn the refuse, clean out and destroy refuse from under

infested houses, treat dogs regularly for fleas, and apply insecticides such as buhach, hot soap suds in dwelling houses, etc.

The introduction of top minnow for the control of mosquitoes was successfully accomplished and these fish seem to be serving as an efficient aid in the control of mosquitoes. Apicultural work of the station included a study of Hawaiian honeys and the problem of largely increasing the production of wax. The latter under favorable circumstances is a much more profitable crop than honey. Foul brood has not yet been introduced into Hawaii. Recommendations were made in regard to the encouragement of silk culture by allowing the laboring population on plantations to have small areas for mulberries and sericultural work.

Additions made to the list of injurious insects thus far reported from Hawaii are presented as are also the accessions of books and periodicals relating to Hawaiian entomology.

Report of the entomologist, H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1906–7, pp. 78–81*).—During the year observations were made on the insect pests of sugar cane, corn, cotton, alfalfa, citrus and other fruits, and garden vegetables. A brief report is also made on cattle ticks and on the movement for the protection of native birds.

Report of government entomologist, 1906, H. C. Pratt (*Agr. Bul. Straits and Fed. Malay States, 6 (1907), No. 9, pp. 303–308*).—Notes are given on the habits and life history of *Nonagria inferens* and *Leptocorisa acuta* which caused injury to rice and also on some unidentified insects which seriously defoliated cocoanut trees.

Indian insect pests, H. M. Lefroy (*Calcutta: Govt., 1906, pp. XII+318, figs. 364*).—The present volume on the insects of India is written not so much as a treatise for the scientific entomologist as for the farmer. The chief insect pests with which the Indian farmer has to contend are described and notes are given on their life history and habits. Most of these pests are illustrated. The volume contains a general account of insect anatomy and their habits, insecticides, and special sections on the more important insect pests of cotton, rice, wheat, sugar cane, corn, leguminous crops, miscellaneous garden crops, and fruits, and the insects affecting cattle. In an appendix to the volume information is furnished regarding the cost, preparation, and application of insecticides.

The life history of the carpenter ant, J. L. Pricer (*Biol. Bul. Mar. Biol. Lab. Woods Holl, 14 (1908), No. 3, pp. 177–217, figs. 6*).—The author made a study of two varieties of *Camponotus herculaneus*. Particular attention was given to the life history of the colony, polymorphism observed in individuals, division of labor, the food, relations to light and color, and the instincts of the insect. It is suggested that some of the injuries to wood which have been attributed to this ant are not due primarily to the ant, but rather to other insects which first produced the burrows in the wood in which the ants subsequently came to live.

An automatic trap for night-flying moths, J. Friedrich (*Centbl. Gesam. Forstw., 34 (1908), No. 1, pp. 1–4, figs. 3*).—In connection with illustrations an apparatus is described for the capture of night-flying moths. The apparatus consists essentially of a revolving drum moved by clockwork and illuminated by means of a lamp on the inside. The moths attracted by the light rest upon the drum and are brushed off into a receptacle during the revolution of the drum. The author reports that tests thus far made with this machine indicate that it is very effective.

The control of snout beetles on beets, B. Wahl and K. Philp (*Wiener Landw. Ztg., 58 (1908), No. 1, pp. 3, 4, figs. 2*).—A brief account is presented of the life history and habits of *Cleonus punctiventris* and *C. sulcirostris*. In

combating these pests good results are reported from the use of a solution containing arsenic, blue vitriol, and lime, and from the application of a 2 per cent solution of barium chlorid. A proprietary remedy containing arsenic was also found to be efficient.

The harlequin cabbage bug, F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Circ. 103, pp. 10, fig. 1*).—The life history and habits of this insect were carefully studied for the purpose of presenting an economic account of the subject and as a basis for suggesting means of control. The harlequin cabbage bug is quite free from the attack of natural enemies, but an egg parasite (*Trissolcus murgantiæ*) is quite effective. Among artificial methods of control the author suggests clean cultural methods, the use of trap crops and hand methods. Kerosense emulsion and other chemical methods have not proved satisfactory.

The insect enemies of the boll weevil, W. D. HUNTER, W. NEWELL, and W. D. PIERCE (*Crop Pest Com. La. Circ. 20, pp. 7, figs. 3*).—Attention is called to the importance of natural enemies in the control of the cotton boll weevil. Particular mention is made of *Solenopsis geminata* and parasitic insects.

The anatomy and development of galls of Isosoma on Agropyron repens and A. junceum, W. and J. VAN LEEUWEN-REYNVAAN (*Marcellia, 6 (1907), No. 3–4, pp. 68–101, pl. 1, figs. 36*).—Particular attention is given to the life history and formation of galls of *Isosoma graminicola*. Notes are also given on *I. agropyri*, *I. hyalipenne*, and other unidentified species of the genus which form galls on grasses.

Papers on Coccidæ or scale insects. The National collection of Coccidæ, C. L. MARLATT (*U. S. Dept. Agr., Bur. Ent. Bul. 16, tech. ser., pt. 1, pp. 10*).—Much interest has been taken in accumulating a thorough and representative collection of Coccidæ ever since the establishment of a Federal entomological service. Brief notes are given on the contributions made to this collection by various workers in this and other countries. At present the collection includes 1,072 species of Coccidæ. A programme has been worked out for the systematic description of scale insects and a number of convenient devices have been prepared for use in the preservation and study of these insects.

Aspidiotus ostreæformis, R. S. MACDOUGALL (*Jour. Bd. Agr. [London], 14 (1908), No. 10, pp. 614–616*).—The insect is described in its various stages and notes are given on its life history. It is recommended that all infested trees before being planted should be fumigated with hydrocyanic-acid gas and that infestations which may occur later should be treated with resin wash.

San José scale in Oklahoma, J. F. NICHOLSON (*Oklahoma Sta. Bul. 79, pp. 67–88, figs. 12*).—This pest has been found by the author at 9 localities in the State but is largely confined to city fruit trees. Notes are given as to its life history, natural enemies and other means of control, together with extracts from the State law relative to nursery inspection, and an account of spraying experiments at Mulhall to determine the efficiency of the lime-sulphur wash in Oklahoma and to compare it with that of whitewash.

The whitewash proved to have no value as a scab destroyer. Excellent results were secured from the lime-sulphur wash. For summer treatment spraying with whale oil soap solution is recommended.

Apple orchard pests in Kentucky, H. GARMAN (*Kentucky Sta. Bul. 133, pp. 14–62, pls. 13*).—Detailed descriptive and economic notes are given on a variety of apple insects in Kentucky including apple-leaf miner, apple-leaf skeletonizer, apple-leaf crumpler, codling moth, apple-leaf roller, cankerworm, tent caterpillar, fall webworm, tussock moth, bagworm, woolly aphis, San José scale, apple-leaf hopper, periodical cicada, etc.

The codling moth in 1907, A. L. MELANDER and R. E. TRUMBLE (*Washington Sta. Bul. 86, pp. 3–17, figs. 5*).—Experiments carried on in 1907 at Walla Walla

and Wenatchee are reported in continuation of previous work (E. S. R., 19, p. 555).

A dust spray of Paris green and lime 1:20 proved inferior to arsenate of lead and is believed to be unreliable in an excessively wormy orchard. In some cases from 20 to 40 per cent of wormy apples were found after its use, and on other trees completely free from worms there was a large proportion of badly distorted apples, the amount of distortion being directly proportional to the amount of dust applied, and no distortion being apparent on adjacent liquid sprayed trees.

Spraying with arsenate of lead with gasoline power sprayers at 180 to 200 lbs. pressure and with extension rods fitted with Bordeaux nozzles set at an angle of about 45° gave in seriously infested orchards 99 per cent of clean fruit. A test of different brands of arsenate of lead confirmed earlier conclusions that "success depends not so much on a correct formula, nor, with the exception of the first spraying, on the exact timing of the sprayings, but altogether on the manner in which the spraying is done."

Thorough spraying with arsenate of lead 1:50 at high pressure, begun when about 85 per cent of the petals have fallen, with a coarse spray with bent nozzle, followed by a second spraying in one week, is recommended.

Spraying for the codling moth, A. L. MELANDER (*Washington Sta. Popular Bul. 5, pp. 7, fig. 1*).—Popular directions based on the above and earlier publications of the station are given with special reference to spraying materials and spraying outfits, and the time, manner, and rationale of spraying.

Annihilating the codling moth, A. L. MELANDER (*Ent. News, 19 (1908), No. 1, pp. 11–13*).—A brief historical outline is given of the improvements which have been made in the methods for combating the codling moth. In the recent tests at the Washington Station, 98 per cent of the codling moths have been destroyed by spraying alone. The author believes that the best method of operation is to spray only once for the early brood. Arsenate of lead is the best insecticide and should be applied abundantly in a coarse spray with a power sprayer.

Spraying for codling worm, H. A. GOSSARD (*Ohio Sta. Bul. 191, pp. 103–125, pl. 1, figs. 23*).—The experiments reported were conducted chiefly to determine whether the drenching sprays advocated for the Western States could be profitably used in the eastern sections. The economic value of soap and other materials added to the spray as "stickers," the number and time of applications, and the selection of arsenicals were also studied. An orchard of about 325 trees near Amherst was used, the trees averaging 20 ft. or more in height.

When arsenate of lead was compared with Paris green for a first application the proportions of sound fruit were respectively 96.39 and 96.72 per cent, but the results are not deemed conclusive. Substituting 1 qt. sodium arsenite solution for 1½ lbs. arsenate of lead in the solution gave as good results and considerably reduced the cost. No marked advantage was obtained from the use of soap, and it is not believed that the addition of soap or other stickers to lead arsenate solution is profitable for apples.

Slightly more sound apples were obtained by the use of straight spraying rods than by crooked rods, but the latter are considered to promote economy of materials and to be a mechanical convenience. Practically no difference in results was noted from the use of coarse and fine nozzles, but as the former required about 50 per cent more materials their use is not recommended.

The average of picked sound fruit at harvest on all sprayed trees of which records were kept was over 95 per cent, while the same average for the unsprayed trees was less than 58 per cent. "The net profit from spraying an average sized tree from 12 to 20 years old throughout one season at a total

cost of from 30 to 50 cts. is from $3 to $7 or more, when apples are worth $1 per bushel."

Eighth report of the Woburn Experimental Fruit Farm, DUKE OF BEDFORD and S. U. PICKERING (*Woburn Expt. Fruit Farm Rpt., 8 (1908), pp. IV+129 +XLI*).—This report is occupied with a study of insecticides and fungicides and the results of their application in the eradication of a few insect and fungus pests.

After a thorough study of Bordeaux mixture the conclusion is reached that the chief aim in making this mixture should be to reduce the lime to the lowest possible proportions consistent with the precipitation of all of the copper. In accordance with this principle recommendations are made regarding the preparation of Bordeaux mixture. For preparing 100 gal. of the mixture, it is recommended that 6 lbs., 6½ oz. of copper sulphate be dissolved in 2 or 3 gal. of water. A quantity of lime not less than 2 or 3 lbs. is to be slaked in 120 gal. of soft water, after which the lime and water are to be stirred 2 or 3 times and allowed to settle until the solution becomes quite clear. Then 86 gal. of clear limewater are to be taken for mixture with the copper-sulphate solution and the whole mixture is brought up to the required 100 gal. by the addition of a sufficient quantity of water. The mixture thus prepared contains 1 oz. of copper sulphate in each 134 oz.

In the use of arsenate of lead it was found that a certain amount of scorching of the leaves occurred in some varieties of apples, however carefully the insecticide was applied. The efficiency of this insecticide, however, is very satisfactory. Calcium arsenate was used as a substitute for lead arsenate and gave results almost equal in efficiency and at smaller expense.

In the preparation of emulsions considerable objections have been made to the use of soaps. In most cases even where soft soaps are used the addition of caustic soda changes soft soap into a hard soap which is only sparingly soluble and is consequently thrown out of solution as a flocculent solid. It became desirable, therefore, to select an emulsifying agent which would not be affected by caustic soda. For this purpose the basic sulphates of iron and copper are perhaps the best reagents to be used. Excellent results were obtained from such emulsions. For a caustic winter wash of this sort the authors recommend a formula calling for ½ lb. iron sulphate, ¼ lb. lime, 2 lbs. caustic soda, 5 pts. kerosene, and water to make 10 gal.

In controlling the oyster-shell bark-louse, it was found possible to destroy the eggs by the use of a 2.5 per cent solution of caustic soda. Moss and lichens were readily removed from trees by a 2 per cent solution of the same substance. Brief notes are also given on experiments with apple psylla, caterpillars, aphis, and leaf spot. It is maintained that all insecticides and fungicides exercise some harmful effect upon the tree and for this reason it is believed that two or three thorough applications are better and less liable to cause harm than repeated applications of less strength.

Spraying apple trees, H. GARMAN (*Kentucky Sta. Bul. 133, pp. 3–13*).—An experiment was conducted for the purpose of comparing the value of Paris green and arsenate of lead and the effectiveness of spraying when trees are in full bloom and after the petals have fallen. The experiment was made on an orchard of about 25 acres and involved the use of various combinations of arsenate of lead, Paris green, lime and Bordeaux mixture.

The average injury from codling moth on trees sprayed with arsenate of lead was one-fourth as great as on trees treated with Paris green and lime, and the injury to trees sprayed with arsenate of lead when in full bloom was nearly four times as great as that to trees sprayed after the petals had fallen. With

Paris green and lime the injury was 17.5 per cent when sprayed in full bloom and 10.17 per cent when sprayed after the petals had fallen.

The results obtained in spraying with Bordeaux mixture for the control of codling moth, bitter rot and apple scab were somewhat disappointing. No conclusive evidence was obtained of serious injury to apples from the use of Bordeaux mixture. It is suggested that the apparent injury to Ben Davis apples may be due to spring frosts.

Insecticides and fungicides for use in the apple orchard, H. GARMAN (*Kentucky Sta. Bul. 133, pp. 69–71*).—Formulas are given for the preparation of arsenate of lead, Paris green, kerosene emulsion, miscible oils, Bordeaux mixture, Bordeaux dust, and lime-sulphur-salt wash.

Principles underlying the preparation of insecticides, MANSIER (*Bul. Soc. Agr. France, 40 (1908), Jan. 15, pp. 86–93*).—The success to be obtained in spraying various insecticides upon plants depends in part upon the physical properties of the insecticide solution. The author presents in a tabular form data regarding the number of drops in 5 cc. of various liquids. Data are also given on the solubility of various substances as insecticides. Gratifying results were obtained from the use of two soap mixtures containing 30 gm. of soap and 50 gm. of oil of tar or 10 gm. of formaldehyde per 10 liters of water.

The cranberry insects of Wisconsin, C. B. HARDENBERG (*Wisconsin Sta. Bul. 159, pp. 3–23, pls. 2*).—Life histories are presented of blackhead cranberry worm, yellowhead cranberry worm, cranberry tip worm, false yellowhead vine worm, oblique banded roller, *Archips georgiana?*, yellow cranberry looper, *Physostegania pustularia*, *Diastictis sulfuraria*, *D. inscptata*, cranberry fruit worm, and cranberry weevil.

Treatment of grape roots for phylloxera, H. FAES (*Chron. Agr. Vaud, 20 (1907), Nos. 20, pp. 467–470; 21, pp. 483–485; 22, pp. 499–510; 23, pp. 533–540*).—An elaborate review is given of the methods employed in various countries in combating phylloxera. A large variety of remedies was tried by the author in controlling this pest, including lysol, lysoform, and various mixtures of soap and sulphocarbonate of potash. The best results were obtained by a mixture containing 1 per cent soap and 3 per cent of sulphocarbonate of potash, the roots being immersed in the mixture for 12 hours. A 2 per cent solution of lysol is also found to be very effective.

A revision of the Ixodoidea, or ticks, of the United States, N. BANKS (*U. S. Dept. Agr., Bur. Ent. Bul. 15, tech. ser., pp. 61, pls. 10*).—The great economic importance of ticks as pests of live stock and as carriers of infectious diseases has created a demand for a systematic account of ticks by means of which a species may be easily identified. This task has been accomplished by the author. A description is given of each species known to occur in the United States and references are made to the economic importance, distribution, and hosts of each species. Analytical tables are given for the identification of genera and species and a bibliography of the subject is appended to the bulletin.

The influence of frost on tick life, F. A. VERNEY (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 12, pp. 1550–1552*).—Advantage was taken of residence in a locality subject to changes of temperature for studying the influence of temperature upon the life and fertility of ticks. It appears that as a rule ticks are killed by a succession of heavy frosts but not by single frosts of even great severity. Frosts of less than 10° appear to have little effect upon the life of ticks. The high bench lands of Natal appear to be naturally free from East coast fever and the disease gradually dies out after it has been introduced. The reason for this natural immunity to the disease is apparently to be sought in the destruction of the ticks by frost.

Influence of high temperatures on the eggs of the silkworm, E. Quajat (*Influenza delle alte Temperature sul Seme Bachi. Turin, 1907, pp. 48*).—In a series of observations under carefully controlled conditions it was shown that the indigenous race of silkworms was capable of enduring a temperature of 42° C. for from 6 to 13 hours. The eggs of the Japanese race are somewhat injured by subjection to a very high temperature but may, however, endure a temperature of 50° C. for 30 minutes.

FOODS—HUMAN NUTRITION.

Some of the present-day problems of biological chemistry, R. H. Chittenden (*Science, n. ser., 27 (1908), No. 685, pp. 241–254*).—The structure of proteids, enzyms and their relation to biological problems, and other important biological questions are discussed in this paper presented before the Biological Section of the American Chemical Society at Chicago, January, 1908.

The occurrence of nitrates in vegetable foods, in cured meats and elsewhere, W. D. Richardson (*Jour. Amer. Chem. Soc., 29 (1907), No. 12, pp. 1757–1767*).—The results are reported of the examination of a large number of samples of animal and vegetable foods.

"Nitrates are of general occurrence in plants in all stages of growth, and particularly in the early stages. In the mature parts of plants, such as ripe seeds and fruits, only small quantities of nitrates are found. In some cases notable quantities of nitrates remain in the mature plant—instance ripe beets and turnips. The amounts of nitrates found in vegetables are of the same order but rather more in many instances than those found in cured meats."

In the author's opinion, a diet wholly or largely of fresh vegetables would supply more nitrates than would a mixed diet consisting in part of cured meats.

On certain imported meat foods of questionable wholesomeness, G. S. Buchanan (*Local Govt. Bd. [Gt. Brit.] Med. Dept., Rpts. Insp. Foods, 1908, No. 3, pp. 17*).—The materials discussed in this report are imported boneless scrap meat, imported pork, and tripe, tongues, and kidneys heavily dosed with preservatives. Methods for regulating the importation and trade in such goods are suggested.

The amount of preservatives found in tripe, tongues, and kidneys was very high and, as the author points out, only a portion is removed in preparation for the table.

On inquiries with regard to the wholesomeness of tripe of home and foreign origin, A. W. J. MacFadden (*Local Govt. Bd. [Gt. Brit.], Med. Dept., Rpts. Insp. Foods, 1908, No. 4, pp. 12*).—A discussion of data noted above from another source.

Meat clubs, D. H. Doane (*Breeder's Gaz., 53 (1908), No. 5, pp. 232, 233*).—A cooperative system of slaughtering and distributing meat is outlined, which, according to the author, has been tried with satisfactory results in rural regions where it is usually difficult to obtain a satisfactory supply of fresh meat, particularly during the warm season.

General statistics of the meat consumed and imported, 1902–1906, J. Betancourt (*Sec. Hacienda [Cuba] Estad. Gen. Consumo é Import. Ganado, 1902–1906, pp. XI+66, pl. 1*).—A summary of statistical data.

Powdered eggs, T. H. Norton (*Daily Consular and Trade Rpts [U. S.], 1907, No. 3055, pp. 7, 8*).—A brief note on an Australian process for evaporating eggs. When dried, the eggs are coarsely powdered and it is said will keep for a long period in an ordinary package if stored in a dry place.

Concerning crab extract, IV, D. Ackermann and F. Kutscher (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 11, pp. 687–691*).—Betain, pyridin-

methyl-chlorid, a new base for which the name "crangitin" is proposed, and neosin were identified in this study of crab extract. For earlier work see a previous note (E. S. R., 19, p. 358).

The proteolytic enzyms of certain vegetable food stuffs, H. Aron and P. Klempin (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 163–184*).—In accord with the results of other investigators, the occurrence of proteolytic enzyms in oats, barley, and vetch was demonstrated. The ferment present in oats can be isolated in the form of a glycerin extract and is more active in acid than in alkaline or neutral solution. Its action is rapid. It was found to induce cleavage in milk proteid and a number of plant proteids very readily, as well as in oat proteid, but this was not the case with other animal proteids, egg albumin being not at all affected and serum albumin affected only after cooking. The possible influence of these plant ferments in animal feeding and in human nutrition is discussed. As the authors point out, the ferments in cereals would usually be destroyed by cooking, but the possibility of a favorable effect from the ferments in raw fruits is spoken of.

Milling of wheats, J. C. Brunnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1906–7, pp. 62–68*).—The examination of a large number of samples of wheat and wheat milling products is reported, but general conclusions, in the author's opinion, could not be drawn, "particularly for the value of 'strength' on which the commercial value of flour from the baker's point of view is chiefly based. . . . As a matter of fact, so far, no generally satisfactory reasons have been brought forward to explain to which factors the strength of a flour is really due; it seems that strength may vary in the same variety of wheat if grown in a different locality, and in different climatic conditions, and again if milled differently."

The milling quality of Washington wheat, R. W. Thatcher (*Washington Sta. Popular Bul. 6, pp. 4*).—A popular account of investigations which have been noted from an earlier station publication (E. S. R., 19, p. 964).

The effect of nitrogen peroxid upon wheat flour, F. J. Alway and R. M. Pinckney (*Jour. Amer. Chem. Soc., 30 (1908), No. 1, pp. 81–85*).—The experimental data reported have been noted from another publication (E. S. R., 19, p. 666).

[Chemistry of the bleaching of flour], S. Avery (*Jour. Amer. Chem. Soc., 29 (1907), No. 12, p. 1767*).—A correction of data previously published (E. S. R., 19, p. 260).

Studies of the cause of coloration in black bread, G. Bertrand and W. Mutermilch (*Ann. Inst. Pasteur, 21 (1907), No. 11, pp. 833–841; Bul. Soc. Chim. France, 4. ser., 1 (1907), No. 20–21, pp. 1048–1051*).—A fuller account of material noted from another source (E. S. R., 19, p. 965).

Wheat and bread, G. Patouret (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 5, pp. 135–142*).—Statistical and other data regarding the composition of flour and bread, the bread supply of Paris, and bread making by the Schweitzer system.

Changes in rye flour due to molds, W. A. Arnoldow (*Vyestnīk Obshch. Hig., Sudeb. i Prakt. Med., 43 (1907), p. 1499; abs. in Chem. Ztg., 32 (1908), No. 2, Repert., p. 10*).—When rye flour molds the quality deteriorates rapidly, material change being noticeable in a day. In 60 to 70 days, 60 to 83 per cent of sterile flour was decomposed by mold. Of the carbohydrates, 12 to 24 per cent was lost in 12 to 24 hours, while the nitrogen content and ether extract did not materially diminish.

Comparative nutritive value of bread and zwieback, C. M. Belli (*Pp. 35; separate from Ann. Med. Nav., 13 (1907); abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 2, pp. 96, 97*).—According to the author's investi-

gations, zwieback is less digestible than bread and possesses a lower nutritive value, though judged by composition 100 parts of zwieback were equal to 131 parts of bread. Taking these facts into account, he considers that zwieback should not form a part of rations for soldiers except occasionally when it is not possible to provide fresh bread.

The vermicelli and alimentary pastes of Annam, C. Crevost (*Bul. Écon. Indo-Chine, n. scr., 10 (1907), No. 67, p. 804*).—A brief note on alimentary pastes called hô-tiêu and song-thân, exhibited at Marseille, and the commercial importance of these products in the East.

Studies of fruit pulp called Netté flour, A. Goris and L. Crété (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 4, pp. 187–189*).—Studies of the proximate and ash constituents of the fruit pulp obtained from tropical Africa, which is called "farine de Netté" and is obtained from a legume (*Parkia biglobosa*).

Note on fruit juice statistics, H. Lührig, P. Bohrisch, and A. Hepner (*Pharm. Centralhalle, 48 (1907), pp. 841–847; abs. in Chem. Zentbl., 1907, II, No. 21, p. 1755*).—The authors examined a large number of samples of raspberry, blueberry, and currant juices, which they had themselves made.

Grape juice cordial (*Brit. Med. Jour., 1908, No. 2453, p. 29*).—Brief data are reported regarding the composition of a concentrated unfermented grape juice designed for use as a beverage on dilution with plain or aerated water.

Concerning alcohol-free beverages, O. Mezger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 1, pp. 14–19*).—Analyses are reported of 44 samples of so-called alcohol-free beverages. All but one of these samples contained less than 1 per cent of alcohol.

Cocoa from the Gold Coast (*Bul. Imp. Inst., 5 (1907), No. 4, pp. 361–369*).—Seven analyses of Gold Coast cocoas, fermented for different lengths of time and washed and unwashed, are reported, as well as other data regarding the cocoas of this region. "The principal defect of these Gold Coast cocoas as a whole is insufficient fermentation, which considerably reduces their market value in comparison with other varieties."

Calorimetric and analytical studies of cocoa, H. Langbein (*Ztschr. Angew. Chem., 21 (1908), No. 6, pp. 241–249*).—A comparative study of commercial brands of cocoa.

Enrilo, a new coffee substitute, A. Beitter (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 1, pp. 21, 22*).—Analyses are reported of a commercial coffee substitute and an infusion made from it. According to the author, it apparently consisted of coarsely ground roasted grains and chicory root. In odor and flavor, the infusion resembled coffee.

Hops, J. C. Brunnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1906–7, p. 74*).—Analyses of Queensland-grown and other hops are reported. The results showed that the amount of soft resins and tannins, which are generally considered of special importance in the valuation of hops, are rather low in the local-grown product. "The total resins also give a value indicating the maturation and development of the aromatic and bitter principles, and the total resins are also low in our Downs hop. Otherwise, aroma, appearance, and other physical properties of the sample were very fair."

Food analyses, J. T. Willard (*Bul. Kans. Bd. Health, 4 (1908), No. 1, pp. 4–12*).—Brief statements are made regarding the examination of samples of Hamburg steak, milk, and other food products, and an investigation of the water content of a number of samples of oysters shipped to Kansas under controlled conditions and of the copper content of oysters is reported.

"From the information at hand it would seem that fresh oysters as placed on the market should have very little liquid with them, and the percentage of the solids in the meats should be the best test of adulteration. It is well known

that oysters will absorb by osmotic action a portion of any water in which they may be placed. At the same time oyster solids pass out to a certain extent into the surrounding water. There is no doubt that in this way not only are the juices of the oyster diluted by the water absorbed, but the flavor is still further impaired by the loss of solids. There is a marked difference in flavor between oysters in a natural state and those in the water-soaked, adulterated condition which has been the rule up to recent time."

The average amount of water found in the meats of 22 samples taken directly from the shells and to which no water was added was 16.3 per cent. Considering the solids in the entire samples, that is, meat and liquor together, the water content ranged from 9.38 to 17.79 per cent.

"Taking everything into consideration the standard of 10 per cent of solids established by the State board of health seems abundantly low. Further, it should be recognized that the addition of water to oysters, with percentages of solids large enough to stand dilution, must be treated as an adulteration. The standard is not to be looked upon as one of excellence, but the minimum that will be tolerated. The average should be much higher; that shown by the samples under consideration is 13.58 per cent."

Copper was found in small quantities in the 34 samples examined, the amount varying greatly. The minimum quantity calculated on the dry matter basis was 0.005 per cent, the maximum 0.17 per cent, and the average 0.05 per cent. "Attention may be called to the fact that the liquor accompanying the oysters has, whenever examined, been found to contain copper in quantities of the same order of magnitude as those found in the meats."

"From the data now at hand, however, it seems safe to conclude that copper is a normal constituent of the oyster. It seems not unlikely that samples carrying the larger quantities may be deleterious, at least to individuals especially susceptible to the toxic effect of the metal. The oysters rich in copper have a coppery taste and a greenish-blue color. A green color in oysters has been observed to be caused by algæ upon which the oysters had fed."

For earlier work see a previous note (E. S. R., 18, pp. 1065).

Report on food products for 1907, W. M. Allen and H. M. Card (*Bul. N. C. Dept. Agr., 28 (1907), No. 12, pp. 64*).—During the year 560 samples of foods and beverages have been examined, including meat, fish, and oysters, catsup and sauces, canned goods, condensed milk, baking powders, jams and preserves, pickles, vinegar, alcoholic and nonalcoholic beverages, etc.

Less than 7.5 per cent of the samples of meat examined were adulterated, a marked improvement over conditions the previous year. Boric acid was the adulterant identified.

Codfish was examined to determine whether boric acid used externally as a preservative would be removed by such treatment as is necessary to remove salt before the fish is eaten, a sample being soaked for 12 hours in 4 times its weight of cold water. The water was then poured off and the sample rinsed in fresh water and boiled for 20 minutes in another quantity of water. The fish was then removed and the water evaporated. It was found to contain only a trace of boric acid.

Ice cream thickeners, G. E. Patrick (*Amer. Food Jour., 3 (1908), No. 2, pp. 11, 12*).—The thickeners most commonly used are gelatin, gum tragacanth, starch, dextrin, and rennet. Methods employed in the examination of ice cream for such thickeners and related questions are spoken of on the basis of the author's investigation of the subject. In view of the fact that by the use of thickeners and regulating the speed of freezers the quantity of ice cream may be materially increased, the author is of the opinion that this material should be sold by weight rather than by volume or measure.

Concerning the requirements of the German pure food laws. J. König (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 10, pp. 621–636*).—In a paper presented at the Fourteenth International Congress of Hygiene and Demography, Berlin, 1907, the author elucidates and discusses the German pure food laws.

Food law requirements, R. Abel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 10, pp. 613–621*).—In a paper presented at the Fourteenth International Congress of Hygiene and Demography, the author discusses the points which should be taken into consideration in formulating pure food laws.

Notices of judgment (*U. S. Dept. Agr., Notices of Judgment 1, pp. 3; 2, pp. 3; 3, pp. 2; 4, pp. 3*).—The notices of judgment have to do respectively with the misbranding of apple cider, of molasses, of flour, and of coffee.

Hygienic cookery, Henrietta W. Calvin (*Industrialist. Agr. Ed. Ser., 1 (1907), No. 3, pp. 33–58*).—Food and its preparation are discussed in this article, which is designed to meet the needs of rural schools and is included in the agricultural educational series, issued in connection with the college extension work of the Kansas State Agricultural College.

The Rising Sun Household Cookery Book, La Mont and Weedon (*Honolulu, 1907, pp. 285*).—Directions are given in Japanese and English for the preparation of meat, fish, vegetables, desserts, etc., the volume being especially designed for the use of those employing Japanese cooks.

The kitchen manual, 1907, Jennie D. Rees (*Memphis, Tenn., 1907, pp. 372*).—An indexed collection of receipts for cooking meat, fish, vegetables, desserts, etc.

How to cook cowpeas, G. W. Carver (*Alabama Tuskegee Sta. Bul. 13, pp. 12*).—A revised edition of an earlier bulletin on this subject (E. S. R., 15, p. 795).

Saving the wild plum crop, G. W. Carver (*Alabama Tuskegee Sta. Bul. 12, pp. 8*).—Believing that the wild plum crop if generally utilized would be valuable for domestic and commercial purposes the author has collected a large number of receipts for making jams, preserves and similar products from wild plums and for their use in various dishes. The possibilities of improving wild plums by cultivation are also pointed out.

Measuring food values, A. Wilson (*Illus. London News [Amer. Ed.], 42 (1908), No. 1084, p. 234, figs. 5, dgm. 1*).—A brief discussion of the Atwater-Rosa-Benedict respiration calorimeter (E. S. R., 18, p. 1151) and the energetics of nutrition.

Metabolism experiments with 32 children 3 to 6 years old. E. Müller (*Biochem. Ztschr., 5 (1907), No. 2–4, pp. 143–303, tables 18*).—In the metabolism experiments reported special attention was paid to determinations of energy value. According to the author's conclusions, children 3 to 6 years old on an average required 87 calories per day or 16.7 calories per square decimeter of surface area. The average coefficient of digestibility of fat was found to be 94.4 per cent and the amount resorbed per kilogram of body weight 3.26 gm. as compared with a consumption of 3.45 gm.

In the author's opinion, the results do not furnish final data regarding nitrogen values, as the possibility of diminishing nitrogen when nitrogen-free material is present in abundance was not studied. The food consumed by the children studied furnished on an average 0.55 gm. nitrogen per day per kilogram of body weight, of which 0.04 gm. was retained.

Minimum protein requirement, J. Forster (*Münchcn. Med. Wchnschr., 54 (1907), No. 49, pp. 2412–2414*).—In a paper presented at the Fourteenth International Congress of Hygiene and Demography, Berlin, 1907, the author discusses protein requirement. In his opinion, the commonly accepted protein

standards should not be lowered. He believes that protein in generous amounts is required on account of the mineral matter which is bound up with it and on account of the stimulating and similar specific bodies which are formed from protein by cleavage and are essential to body well-being and resistance to disease. Furthermore, he believes that the whole question of proteid metabolism is not yet sufficiently understood to warrant final deductions.

A contribution to the study of calcium metabolism, S. W. Patterson (*Biochem. Jour., 3 (1908), No. 1–2, pp. 39–54*).—In experiments in which rabbits were fed on oatmeal and corn meal, a diet which leads to calcium starvation, the ratio of calcium in the blood to total ash in the blood remained much the same as in a normal animal. The ratio of calcium to total mineral matter in the bones was, however, not constant and showed fairly wide fluctuations even in the normal animal. As the author points out, it has been frequently shown that bones lose calcium when the animal is placed on a diet poor in this constituent. The results which he obtained, however, tend to show "that the bones can lose calcium relatively to the other salts, that is, by a selective autolysis and not by an autolysis of bone in mass."

The results of experiments in which he was himself the subject showed that calcium can be readily stored during nitrogen retention. "More interesting, however, are the experiments with rectal feeding, where calcium was stored despite a continuous drainage of nitrogen from the body. In the latter case, as the proteid absorbed from the food was insufficient, the muscles and glands must have been diminishing in bulk, and yet calcium was retained. This fact rather points to the bones as the seat, in this case, of calcium storage." On a fixed diet the renal excretion of calcium varied only slightly, the variations being parallel with the total amounts of urine excreted.

Studies of the importance of calcium salts for the growing body, H. Aron and R. Sebauer (*Biochem. Ztschr., 8 (1908), No. 1, pp. 1–28, pl. 1, dgms. 2*).—According to the authors' conclusions, the calcium requirement of young and growing animals is equivalent to at least 1.2 per cent of the gains in body weight. Judging by the results of the experiments, which were made with small animals (rabbits and dogs), a deficiency of food calcium does not affect body weight or growth in general provided the deficiency is not too great. The ill effects of such a deficiency are confined almost exclusively to the skeletal system and resemble clinically and anatomically the pathological conditions noted in rickets. Chemical analyses showed that such bones had normal weight but contained a larger proportion of water and less dry matter than normal bones and that the dry matter was deficient in mineral constituents. It was apparent, therefore, that deficiency in food calcium caused the formation of bones with an excess of water and with organic material insufficiently calcified.

The influence of surrounding temperature on carbon dioxid output in subjects at rest without clothing, J. Ignatius, L. Lund, and O. Wärri (*Skand. Arch. Physiol., 20 (1908), No. 3–4, pp. 226–232*).—According to the investigations reported with subjects at rest without clothing, combustion in the body showed a tendency to diminish when the surrounding temperature was moderately high, 31 to 32° C., but the decrease was neither very large nor very marked. The minimum carbon dioxid output was noted at a certain temperature, 26.1 to 29.4°, and increased when the temperature of the surrounding air was lower or higher.

Concerning the rôle of powdered meat, P. Lassablière (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 4, pp. 180–182*).—Experiments are reported in continuation of earlier work (E. S. R., 19, p. 358), and the author concludes that powdered meat acts as a digestive stimulant, though he believes it is valueless

as a nutrient and sometimes dangerous. The experiments were made with dogs.

The biological significance of lecithin, I, W. Glikin (*Biochem. Ztschr., 7 (1907), No. 3, pp. 286–298*).—A comparison of new-born mammals (dogs, rabbits, and cats) with birds featherless when newly hatched showed that there were close resemblances and indicated that helplessness at birth implies a high lecithin content.

The rôle of osmotic pressure in the phenomena of animal life, J. Demoor et al. (*Mém. Acad. Roy. Belg., 2. ser., 2 (1907), pp. 112; abs. in Biochem. Centbl., 7 (1908), No. 1, pp. 8, 9*).—In the investigations reported salt solutions of different concentration were passed through different organs and the changes in volume and rate of passage were noted. The special apparatus used in these experiments is described.

ANIMAL PRODUCTION.

Experiments on the digestibility of prickly pear by cattle, R. F. Hare (*U. S. Dept. Agr., Bur. Animal Indus. Bul. 106, pp. 38, pl. 1, fig. 1*).—Using steers as subjects, five experiments were made to determine the digestibility of prickly pear of different sorts alone and fed with alfalfa and cotton-seed meal in comparison with alfalfa hay alone. The income and outgo of nitrogen was also studied.

According to the author's conclusions—

"The average digestibility of the nutrients of prickly pear as determined in the first experiment where *Opuntia lindheimeri* was used were: Dry matter, 65.86 per cent; ash, 33.68 per cent; protein, 57.47 per cent; fat, 68.38 per cent; crude fiber, 41.32 per cent; nitrogen-free extract, 81.78 per cent.

"In the second experiment where the variety *O. lævis?* was used the coefficients of digestion were: Dry matter, 63.96 per cent; ash, 35.81 per cent; protein, 40.87 per cent; fat, 69.02 per cent; crude fiber, 53.99 per cent; nitrogen-free extract 78.95 per cent.

"In general these results would perhaps show a somewhat low coefficient for protein, a decidedly low coefficient for ash, but a very high coefficient for the nitrogen-free extract. The total digestible nutrients are about equal to those of immature green corn fodder.

"Our experiments seem to show that when prickly pear is fed with cured fodders or grains the digestibility of both is increased. For this reason prickly pear has a greater food value than is shown by its analysis and digestion coefficients.

"The nutritive ratio, i. e., the ratio of proteids to carbohydrates, is very wide for this feed, and in feeding it to all classes of animals, for whatever purpose, much better results should be obtained when it is fed with some substance of a high protein content.

"While the digestibility of the ash was apparently small, as noted above, yet the large amount of ash contained in these plants caused more ash to be assimilated from a ration equivalent to 15 lbs. of dry matter than is ordinarily assimilated from an equal ration of alfalfa, which has a higher coefficient of digestion for its ash.

"The steers seldom drank water when fed prickly pear alone. In fact, in feeding a ration of 100 lbs. of this feed per day the animals obtained from the feed over 8 gal. of water, which is more than was usually drunk by them when fed cured fodders alone.

"While no digestion experiments were made with any of the cacti other than prickly pear, the digestion coefficients of the latter could probably be safely

used for all other members of this family, since their composition and other characteristics are similar."

Concerning the composition and digestibility of hay from sewage meadows, J. Volhard (*Landw. Vers. Stat., 68 (1908), No. 1–2, pp. 11–18*).—Using sheep as subjects, the digestibility of early-cut and late-cut hay from sewage meadows was studied. The author calculated that the early-cut hay had a starch value of 30.5 and the late-cut hay of 29.1.

The composition of hay from sewage meadows and the question of feeding calcium phosphate, P. Ehrenberg (*Landw. Vers. Stat., 68 (1908), No. 1–2, pp. 19–38*).—The author reports results of a number of investigations which he has carried on and summarizes the work of other investigators. According to his analyses, the sewage meadow hay under consideration regularly contained more protein and albumin than ordinary meadow hay from a similar locality. The sewage meadow hay was richer in phosphoric acid and contained on an average less calcium.

The desirability of feeding lime instead of calcium phosphate with sewage meadow hay is discussed but, in the author's opinion, can not be definitely decided on the basis of evidence now available.

German potato flakes, J. E. Kehl (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3122, pp. 5, 6*).—The manufacture of flakes from the surplus potato crop and the commercial importance of such products are considered, and rations containing potato flakes are suggested suitable for calves, cows, pigs, and horses.

"Nsa-Sana" seeds from southern Nigeria (*Bul. Imp. Inst., 5 (1907), No. 4, pp. 369, 370*).—Oil was expressed experimentally from Nsa-Sana seeds (*Ricinodendron africanum*) and the specific gravity and other constants determined. The oil is similar to t'ung oil (Chinese wood oil), which is of importance commercially. It is stated that the cake remaining after the expression of the oil would have a feeding value approximating that of decorticated cotton-seed cake, but as there are indications of the presence of an alkaloid, it would be necessary to study the material thoroughly before it could be recommended for such a purpose. It could, however, be utilized as a fertilizer, since it is rich in nitrogen.

Dried grape marc as a feed for farm animals, Sémichon (*Soc. Aliment. Rationn. Bétail, Compte Rendu 12. Cong., 1907, pp. 144–150*).—A paper with discussion on the feeding value of grape marc.

Experiments on the composition and digestibility of some by-products from ethereal oil manufacture, F. Honcamp and T. Katayama (*Landw. Vers. Stat., 67 (1907), No. 1–2, pp. 105–128; Sächs. Landw. Ztschr., 55 (1907), No. 36, pp. 953–955*).—Studies of the composition and digestibility of the materials remaining when oil is made from ajowan (*Carum ajowan*), celery seed, and coriander seed. The digestion experiments were made with sheep. In general, only about 50 per cent of the protein was assimilated.

Composition of Hawaiian feeding stuffs, Alice R. Thompson (*Hawaii Sta. Rpt. 1907, pp. 63–66*).—Analyses are reported of sorghum, sorghum silage, corn cut for the silo, corn silage, millet roots, hilo grass, Rhodes grass, pili grass, para grass, side oats grama, and other grasses, wheat hay, rice straw, alfalfa, cowpea forage, cassava refuse from starch making, taro waste, *Tacca pinnatifida*, ti root, beets, algeroba beans, algeroba bean meal, Spanish needles, pakana (*Medicago officinalis*), rape, and annual ilima (*Sida* sp.).

Feeding stuff inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 156, pp. 157–202*).—Under the provisions of the State law upward of 500 samples of feeding stuffs were examined, including cotton-seed meal, cotton-seed feed, linseed meal, gluten feed, distillers' grains, brewers' grains and malt sprouts, miscellaneous reenforced feeds, molasses and sugar feeds, corn, barley

and oat feed, corn and oat feeds, hominy feeds, rice feed, poultry feeds, wheat offals, and beef scraps. According to the author, in general the cotton-seed meal samples were of good quality. As regards cotton-seed feed, "one pound of choice cotton-seed meal is equal to 2 lbs. of cotton-seed feed." In general the distillers' grains were somewhat below their guaranty in protein.

In connection with the study of gluten meals and feeds the goods and feeds were examined for the presence of foreign coloring matters and for the proportion of acid present, the results being compared with those obtained with corn meal. "All the samples, including the corn meals, exhibited traces of sulphuric acid, but those glutens which gave the highest percentages of total acidity usually seemed to carry more sulphuric acid than the others. The greater part of the acid present in excess, however, was hydrochloric, which varied considerably in the different samples, the variations for the most part agreeing quite closely with the variations in total acidity." In 8 samples coal tar color was detected, in 6 none was found, while the remainder were not examined for such materials.

The feeding stuffs were also examined for the presence of weed seeds and germination tests were made. The nitrogenous feeds were with 2 exceptions free from weed seeds. Such seeds were quite generally found in varying amounts in the miscellaneous reenforced feeds and poultry feeds and in the majority of the wheat offals, though usually weed seeds were reported as few in number in this class of goods. "The most flagrant offenders carrying live weed seeds are the molasses or sugar feeds."

Believing that mold growth might have interfered with germination in the trials which were undertaken, this point was further studied, mold being hindered by treating the seeds with a dilute solution of formaldehyde. It was found "that a number of the brands of feeds which showed no germination in the first test did, under more favorable conditions, sprout numbers of the weed seeds which they contained." The general question of the introduction of weed seeds into feeding stuffs, both whole grains and other feeds, is discussed with reference to State legislation on this matter and the bearing of a decision of the U. S. Board of Food and Drug Inspection on this subject is pointed out.

Commercial feeding stuffs, T. L. Calvert (*Off. Rpt. Sec. Ohio Bd. Agr. on Com. Feed Stuffs, 1907, pp. 26*).—Under the provisions of the State law analyses were made by H. A. Weber of 126 brands of dried distillers' grains, cotton-seed meal, gluten feed, malt sprouts, hominy feed, commercial mixed feeds, including those containing molasses, ground flax flakes, condimental feeds, meat meal, and poultry feeds.

Licensed concentrated feeding stuffs, F. W. Woll and G. A. Olson (*Wisconsin Sta. Bul. 163, pp. 19–31*).—A list is given of the concentrated commercial feeding stuffs which have been registered by manufacturers for the calendar year ending December 31, 1908.

Experiments on the digestion of different quantities of feed by swine, T. Katayama (*Landw. Vers. Stat., 68 (1908), No. 1–2, pp. 1–10*).—The experiments reported show, in the author's opinion, that the quantity of feed taken did not materially affect the digestibility of the different constituents of the ration.

Studies of the nitrogen, phosphorus, and sulphur in organic combination in vegetable products, A. Stutzer (*Biochem. Ztschr., 7 (1908), No. 4–6, pp. 471–487*).—Rye, oats, cocoanut cake, cotton-seed meal, hay, and other vegetable materials were examined and in connection with the work natural and artificial digestion experiments were also made. The view that phosphorus occurs principally in organic forms in plants and especially in the seeds was confirmed

and extended. Sulphur also was found to occur chiefly in organic forms, as has been pointed out by other observers.

The vegetable material insoluble in acid gastric juice contained nitrogen, phosphorus, and sulphur in organic compounds, but no definite relation between these elements or between any two of them could be noted in the different vegetable products studied.

In feeding experiments with sheep, it was found that feces contained a larger amount of organic phosphorus and sulphur than was to be expected from the character of the rations (hay with and without oats). Metabolic products were present in the feces containing the insoluble phosphorus and sulphur compounds, which were also insoluble in acid gastric juice.

According to the author, the nature of the organic sulphur compounds is not known, particularly those which occur in plants and are insoluble in acid gastric juice and also the insoluble organic sulphur compounds remaining in the feces.

Elimination of phosphorus by Herbivora, A. Gouin and P. Andouard (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 3, pp. 133–135*).—The authors studied the effect of different rations on the excretion of phosphorus by Herbivora with special reference to the observed fact that with young animals the urine contains practically all the phosphates excreted, while such is not the case with older animals.

The action of fresh cola nuts on muscular work, J. Chevalier and Alquier (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 2, pp. 86–88*).—Experiments with 2 horses showed that more work was performed on a ration with than without fresh cola nuts. A loss in body weight and increased body temperature were noted during the cola nut period and the authors conclude that the extra work is performed at the expense of body material. Cola nuts are regarded as a stimulant and their use is not considered desirable except when forced work is necessary.

The influence of sexual function on metabolism, F. Tangl (*Landw. Jahrb. 37 (1908) No. 1, pp. 45–50*).—In the studies reported, when a stallion covered a mare the quantity of urine was not increased nor was the renal excretion of nitrogen or phosphorus. This showed, according to the author, that the metabolism of protein and of phosphorus yielding bodies is not materially increased, and so he concludes that it is not necessary to provide stallions with a ration especially rich in phosphorus.

The effects of environment and nutrition upon fertility, F. H. A. Marshall (*Sci. Prog. Twentieth Cent., 2 (1908), No. 7, pp. 369–377*).—The effect of feed on productivity and character of the young and related questions are discussed and data bearing on this subject summarized.

According to the author, the largest percentage of lambs was obtained, in tests which he quotes, from flocks kept on grass during the greater part of the year, but artificially stimulated by feeding the ewes for a time turnips, oats, dried grain, maize, or other similar feed. The data summarized fully confirm the conclusion "that stimulation of the generative organs of sheep by a system of special feeding at the beginning of the breeding season results in an increased crop of lambs at the following lambing season. The twins appear almost invariably to have been born early during lambing, thus showing that the reproductive activity of the ewes is usually greatest at the beginning of the breeding season."

Experiments in calf feeding, A. Gouin and P. Andouard (*Soc. Aliment. Rationn. Bétail, Compte Rendu 11. Cong., 1907, pp. 11–28, 127–130*).—A paper with discussion summarizing the authors' experiments in which rations with and without skim milk were used in calf feeding and potassium phosphates, rock phosphate, sweetbread, thyroid, protylin, and powdered bone were added to the

rations. The digestibility was determined, as well as gains in weight. The results reported emphasize the authors' general conclusion regarding the high efficiency of bone phosphate in calf feeding. That lime is no less necessary than phosphoric acid is also pointed out. For earlier work see previous notes (E. S. R., 16, p. 294; 19, p. 468).

Skim milk for raising and fattening calves, L. Malpeaux (*Soc. Aliment. Rationn. Bétail. Compte Rendu 11. Cong., 1907, pp. 1–10, 126, 127, dgms. 2*).—A paper with discussion. According to the author, 2 calves fed for 84 days on pan-skimmed milk gained on an average 0.945 kg. per head per day as compared with 0.892 kg. in the case of similar calves fed the separator-skimmed milk.

In a comparison of pasteurized with raw sweet milk, it was found that the average daily gain of 2 calves in 112 days on the former was 0.888 kg. per head and on the latter 0.844 kg. In a similar comparison of skim milk and sour milk the average gains were respectively 0.843 kg. and 0.776 kg.

When denatured sugar was used to supplement skim milk in calf feeding the average daily gain in 85 to 112 days was 0.964 kg. per head as compared with 0.867 kg. in a similar test in which starch was used.

Denatured sugar and a decoction of flaxseed were also compared as supplements for skim milk. In 153 days the average daily gain of the 2 calves on the former was 0.250 kg. and on the latter it was 0.225 kg.

As the author points out, the 20 per cent of feeding cake used for denaturing the sugar added to its nutritive value. Forty to 45 gm. of sugar per liter of skim milk is advisable. Large quantities cause scouring.

See also a previous note (E. S. R., 19, p. 171).

Feeding experiments with diastasolin, Reichert (*Molk. Ztg., 22 (1908), No. 4, pp. 77, 78*).—In an article quoted from *Königsberger Land- und Forstwirtschaftliche Zeitung*, the author reports satisfactory results from the use of potato starch inverted with diastasolin as a feeding stuff for calves.

Calf feeding, E. V. Strebel (*Württemb. Wchnbl. Landw., 1908, No. 5, pp. 87–92*).—On the basis of extended experience at Hohenheim, feeding and weaning, cost of rations, and gains in weight of calves up to 2 years old are discussed.

Animal production in Argentina, S. Baldassarre (*La Zootecnia nell' Argentina. Naples, 1906, pp. X+236, pl. 1, figs. 58*).—A general discussion of breeds, feeding, care, and management, slaughtering and marketing, and of dairying in Argentina.

Cattle raising, E. Hnos (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 9, pp. 47, pls. 7*).—The importance of cattle raising, the conditions which affect the local cattle-raising industry, and general topics of breeding, care, and management are discussed.

Cattle, French and foreign, P. Diffloth (*Races Bovines. France—Étranger. Paris, 1908, pp. 426; rev. in Nature [London], 77 (1908), No. 1998, p. 339*).—French and other cattle are described in this volume which is included in the series *Encyclopédie agricole. Zootechnie.*

The improvement of Egyptian cattle, T. P. Goodchild (*Yearbook Khediv. Agr. Soc. Cairo, 1906, pp. 141–157, pls. 6*).—The author believes that the improvement in Egyptian cattle, which is very essential, can be best secured by selection and that crossing with other sorts of cattle would not give satisfactory results. Management of cattle under local conditions, the utilization of Egyptian feeding stuffs, and other matters are considered.

Live and dead weight of Egyptian animals, J. S. J. McCall (*Yearbook Khediv. Agr. Soc. Cairo, 1906, pp. 191–199*).—To secure data on which to calculate the carcass value of the different kinds and breeds of animals slaugh-

tered for market in Egypt, the live and dressed weight of cattle and buffalo of different ages and of camels and sheep of different breeds were determined.

According to European standards, the author points out that the dressed weight of fat steers should equal 58 per cent of the live weight and animals dressing 50 per cent are considered lean and unfit for killing. "If we consider Egyptian animals by this standard we find that very few of the cattle reach it, although many of the sheep exceed 50 per cent."

The article also contains information regarding the prices and use of meat in Egypt and related topics. According to the author, buffalo veal is in great demand and is the most expensive meat sold in Cairo. Camels, particularly Syrian or Shami camels, are slaughtered to some extent and the flesh sold to the poorer people. On an average the dressed weight of Syrian camels is 58 per cent of the live weight.

Sugar for fattening sheep, L. Malpeaux (*Jour. Agr. [Paris], 43 (1908), I, No. 2146, pp. 12–15, dgm. 1; abs. in Illus. Landw. Ztg., 28 (1908), No. 4, p. 22, dgm. 1*).—In a test covering 84 days the average daily gain per head on a ration containing sugar was 202 gm. as compared with 127 gm. per day on a ration without it. When slaughtered the flesh of the sugar-fed sheep was found to be of most excellent quality.

On account of its value as an appetizer and also as a source of nutritive material, the author concludes that denatured sugar is a valuable feeding stuff.

An attempt to acclimatize sheep at Kelantan (*Bul. Écon. Indo-Chine, n. ser., 10 (1907), No. 67, pp. 815–819*).—In general, this attempt to acclimatize sheep in Indo-China has been successful. The report gives some data on the feeding stuffs used, gains in weight, number of lambs born, etc.

Rations for fattening hogs, W. T. McDonald and J. S. Malone (*Oklahoma Sta. Bul. 80, pp. 89–96*).—Meat meal in larger and smaller amounts, cotton-seed meal, alfalfa hay and cowpea hay as supplements to corn meal were compared with corn meal alone in a test made with 6 uniform lots of 5 pigs each. The cotton-seed meal ration, which consisted of 4 parts of corn meal to 1 of cotton-seed meal, was alternated every 2 weeks with corn meal alone. In the 56 days of the test the smallest total gain, 173 lbs. per lot, was noted with the corn meal ration, and the greatest gain, 484 lbs., on corn meal and meat meal 7 : 1. On corn meal and meat meal 11 : 1 it was 473 lbs. On the other rations it ranged from 245 lbs. on corn meal and cotton-seed meal 4 : 1 to about 285 lbs. on corn meal and alfalfa hay ad libitum. The feed eaten per pound of gain ranged from 4.37 lbs. on corn meal and meat meal 11 : 1 to 8.01 lbs. on corn meal alone, and the cost of a pound of gain from 4.73 cts. on corn meal and meat meal 11 : 1 to 8.01 cts. on corn meal alone.

Stock food for pigs, J. W. Wilson and H. G. Skinner (*South Dakota Sta. Bul. 105, pp. 300–317, figs. 9*).—In the first of the two series of tests reported, which included two years, five commercial stock feeds with ground corn and barley were fed in comparison with ground corn and barley, 1 to 1. The feeding period in the first year covered 92 days and in the second 63 days, and the lots included from 8 to 10 pigs. In every case the pigs had access to rape pasture.

On the check ration the average daily gain per pig for the two years was 1.1 lbs., the feed required per pound of gain, 5.19 lbs., and the cost of a pound of gain 4 cts. On the ration including stock feeds the daily gain ranged from 1.17 lbs. per head to 1.34 lbs., the grain eaten per pound of gain from 4.54 to 4.86 lbs., and the cost of a pound of gain from 4.16 to 4.58 cts.

In the second series of tests, corn meal was compared with corn meal and a commercial stock feed, and with corn meal and a home-made stock feed, using three lots of 8 pigs each fed for 61 days. All the lots had the run of blue grass pasture in addition to the grain or grain and stock feed. The total gain was 514

lbs. on corn meal alone, 483 lbs. on corn meal and commercial stock feed, and 551 lbs. on corn meal and home-made stock feed. The feed required per pound of gain in the three cases was 4.91, 5.49, and 5.11 lbs., and the cost of a pound of gain, 3.85, 4.69, and 4.4 cts.

"From the above table it will be seen that it required more pounds of feed for 100 lbs. of gain in this experiment, than it did for the average of the lots in the previous experiment. This can be accounted for from the fact that the rape pasture furnished a more succulent feed than did the blue grass pasture."

"From the data presented in this bulletin the reader must draw his own conclusions as to the value of any of the stock foods tried."

The home-made stock feed, according to the authors was made up as follows:

"Gentian, 2 lbs., cost $0.50; ginger, 1 lb., cost $0.40; sodium bicarbonate, 1 lb., cost $0.10; fenugreek, 0.5 lb., cost $0.10.

"Purchase these materials at a drug store and have them mixed into fine powders. Then mix with 5 lbs. of common salt and 25 lbs. of shorts. This compound will cost about 4½ cts. per pound. For the pig mix 1 lb. with every 48 lbs. of grain.

"This furnishes a comparatively cheap stock food, but even this preparation did not make as cheap a gain as when no stock food was fed."

The composition of the stock feeds used was determined by J. H. Shepard, whose report is included in the bulletin. They were found to consist of such drugs as salt, capsicum, ginger, charcoal, fenugreek, sulphur, etc., with such materials as bran, ground bark, mill refuse, and oil meal.

Some suggestions to farmers who kill their own hogs on the farm or plantation, C. Schuler (*Ann. Rpt. Agr. and Indus. Statis. Bd. Agr. and Immigr. [La.], 1907, pp. 5, 6*).—Directions for the home-curing of ham and other pork products are given.

Notes on horse feeding, E. Vital (*Allg. Brau. u. Hopfen Ztg., 48 (1908), No. 44, pp. 453–455*).—This summary and discussion of horse-feeding problems provides a bibliography of recent work on the subject.

Feeding tests with bran-molasses for horses, L. Pape (*Deut. Landw. Presse, 35 (1908), No. 10, pp. 95, 96*).—On the basis of experience, the author believes that bran-molasses is a satisfactory feeding stuff for horses.

The feeding of the pure blood horse, L. Grandeau (*Paris, 1907, pp. 8, fig. 1; reprinted from Compt. Rend. Cong. Hippique, 1907*).—In a paper presented at the Horse Breeding Congress at Paris, June, 1907, the author discusses the value of dried and ground skim milk as a feeding stuff for horses and gives an account of a horse which was raised on this material supplemented by hay. When about 2 years old 7 kg. of the milk powder was fed per day. At this time the horse weighed some 445 kg. According to the author, he was well developed and in splendid condition.

In a discussion which followed the paper the author states that the Algerians feed their horses exclusively on sheep milk, giving them some 30 liters per day.

The use of dried skim milk for feeding a pure blood horse, Baron Peers (*Soc. Aliment. Rationn. Bétail, Compte Rendu 11. Cong., 1907, pp. 130–133*).—A general discussion of the value of dried skim milk in horse feeding, the author citing the work on this subject noted above.

Proceedings of the Horse Breeding Congress, Paris, 1907, J. M. de Lagorsse (*Compt. Rend. Cong. Hippique, 1907, pp. 160, fig. 1*).—The proceedings, list of members, and other general data are included in this report of the meeting of the Horse Breeders' Association, Paris, June 21 and 22, 1907. Among the reports presented were The Actual Situation and Production of Horses in France, by Viseur; Exportation of French Horses, by Le Gentil, etc.

A paper on the feeding of a pure blood horse with skim milk powder is noted above.

The grade stallion situation in Wisconsin, A. S. Alexander (*Wisconsin Sta. Bul. 158, pp. 3–35, figs. 12, map 1*).—With a desire of improving eixsting conditions, the author discusses the number and character of stallions kept in Wisconsin, pointing out the bad qualities of many of them and making numerous suggestions for betterment. According to the author, there are in the State 1,974 stallions licensed as grades, while there are but 1,286 pure-bred stallions in service. Of those licensed as grades, moreover, 136 were pronounced by their owners as of unknown breeding and 34 were certified to as of mixed breeding. As regards breeds, 43 per cent of the pure-breds were Percherons and 30 per cent trotters.

Safety for new-laid eggs (*Illus. London News* [*Amer. Ed.*], *42* (*1908*), *No. 1088, p. 376*).—A homemade nest is described having a false bottom made of 2 inclined boards with a space between them. These are covered with straw as is also the bottom of the box underneath the opening. The new-laid egg slides down the incline and falls into the lower receptacle where it can not be pecked or broken by the fowls. If a nest egg is used, it may be fastened to the side of the nest or to the false bottom.

The marketing of poultry (*Jour. Bd. Agr.* [*London*], *14* (*1908*), *No. 11, pp. 641–651*).—A summary of data and discussion of market requirements for chickens, ducks, geese, and turkeys in different English markets. It is stated that the demand for high-class poultry in Great Britain has increased very greatly within recent years.

National standard squab book, E. C. Rice (*Boston, 1908, pp. 232, pl. 1, figs. 74*).—Pigeon houses, nest bowls and nests, water and feed, laying and hatching, killing and cooling, the markets, pigeon diseases, and other questions are discussed in this volume, which is designed as a handbook of squab raising.

Breeding for squabs, F. A. Sotter (*Douglassville, Pa., 1908, pp. 75, pls. 14*).—Breeding, feeding, care, and management, diseases, and other matters of importance in squab raising are discussed and a number of receipts are given for cooking squabs.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Sources of bacteria in milk, W. M. Esten and C. J. Mason (*Connecticut Storrs Sta. Bul. 51, pp. 65–109, figs. 8, dgm. 1*).—The significance of kinds rather than of numbers of bacteria in milk is especially emphasized and the different kinds of bacteria that get into milk are classified in groups. These are also tabulated with respect to the source from which they arise, the latter classification depending largely upon the results of investigations discussed by the authors, the purpose of which was to discover the sources of bacteria and means of eliminating them by practical methods from the milk.

According to the authors the cow is the chief source of the bacteria that get into the milk. These come from the interoir of the udder and from the surface of the cow's body. With regard to the udder organisms it is stated that "the flora of bacteria in the normal healthy udder is a rather small one, averaging from 2 to 8 varieties in each udder. The udder is composed of 4 divisions, each separate from the other 3 divisions. There may be one or more different kinds of organisms in each quarter. The number of varieties that come from the udders of a number of cows is a large one. In a herd of about 25 cows there were found to be over 50 varieties of bacteria. Fifty-five per cent of these had no visible effect on sterile milk when inoculated as a pure culture. Thirty-eight per cent turned milk slightly acid, and 7 per cent turned milk to

an alkaline reaction. The micrococci varieties which grow in groups of 4 predominated to the extent of 95 per cent. One variety of micrococci seemed to be dominant and was present in frequency of occurrence 22 times in comparison to other varieties which were present 9, 8, 7, 3, 3, and 2 times, respectively.

"The most abundant source of bacteria that get into milk is the surface of the cow. Some fall on the cow with the dust that settles into the hair. Others accumulate from contamination with cow feces. Organisms from this source are the most serious and most objectionable." A gram of the powder obtained by currying the cow was found to contain 207,000,000 organisms. As to hay as a source of bacteria 28 tests, continuing weekly from October 17 to May 28, were made of the number of bacteria per gram of a hay including timothy, red top, rowen, semiswail, and swamp hay, taken from all parts of the hay loft. The average number of bacteria per gram for all these tests was 16,800,000. "In order to compare the numbers of organisms on hay and on grass from early spring to time of cutting, tests were made of the numbers on grass in the different stages of development. The sources of grass were pasture land, semifertile fields, very fertile fields, and near buildings. Clover and rye were incidentally included. The average number of bacteria per gram for all samples was 15,000,000, a number nearly the same as that found in cured hay."

To ascertain the kinds of bacteria that get into milk from hay "twenty-five of the most abundant kinds were picked out and analyzed. Ten of these, or 40 per cent, were spore-forming bacteria; 18, or 72 per cent, were liquefiers (decay and decomposition bacteria); 22, or 88 per cent, were rod-shaped bacteria, and 12 per cent were cocci or spherical bacteria; 18, or 72 per cent, were motile capable of swimming around in milk and getting into all parts of it, causing much more rapid changes than those that are motionless."

According to the authors, the bacteria found on grass are mostly from soil contamination. To determine whether these grow on the surface of plants "the first spring growth of grass on April 18 was clipped off with sterile shears and a gram was plated for numbers. There were found 455,000 per gram. Over this spot was placed a bell jar, to keep out all contaminations. On the thirtieth of April a gram of grass was taken from under the bell jar and plated for numbers. The number of bacteria now was only 114 per gram, showing that the bacteria on grass are largely bacteria from some other source. If they do multiply on grass it is at a very slow rate. There was no evidence of *Bacterium lactic acidi* present on this sample of grass."

Grain feeds were found to be liberally stocked with organisms. The examinations made show that the percentage of acid organisms is more than twice as large, while that of liquefying organisms is only half as large, as that for hay.

The agency of flies as a source of bacteria was indicated by tests showing that from 414 flies an average of about 1,250,000 bacteria for each fly was obtained. The relation of the prevalence of flies to an increase in intestinal diseases is discussed.

The number of bacteria that could be washed from the hands of a milker who had been working around the farm previous to milking was found to be 45,000,000 before the hands were washed.

Bacterial growth and chemical changes in milk kept at low temperatures, Mary E. Pennington (*Jour. Biol. Chem., 4 (1908), No. 4–5, pp. 353–393; abs. in Science, n. ser., 27 (1908), No. 687, p. 331*).—In milk kept at a temperature of −0.55° C. there was a steady increase in the number of organisms for 5 or 6 weeks. Acid formers were in lower proportion and liquefying organisms in higher proportion than is commonly found. Certain species were especially resistant to cold and frequently were predominating or almost in pure culture at

the end of the experiment. The casein of the milk in cold storage was rapidly digested until more than 50 per cent of it was changed to soluble compounds.

The milk of cows afflicted with foot-and-mouth disease, G. CORNALBA (*Agr. Mod., 14 (1908), No. 8, pp. 103, 104; Indus. Latt. e Zootec., 6 (1908), No. 8, pp. 83, 84*).—A brief summary of information, showing that the quantity of milk given diminishes somewhat according to the gravity of the infection, ranging from a loss of one-third to that of the total amount of milk. The chemical composition is not noticeably altered, but the physical characteristics are somewhat different from those of normal milk. The milk should not be used for food.

Tests of dairy cows, 1906–7, F. W. WOLL and R. T. HARRIS (*Wisconsin Sta. Bul. 160, pp. 3–39, pl. 1, figs. 16*).—The tests previously referred to (E. S. R., 20, p. 77) are here reported in more detail, and photographs of a considerable number of the cows included in the tests are reproduced.

The Kirkee civil dairy, F. FLETCHER (*Dept. Agr. Bombay, Ann. Rpt. Expt. Work Poona Agr. Sta. 1906–7, pp. 20–33*).—The objects of the dairy are stated and the records of the yields and financial returns by several groups of cows and buffaloes of different breeds are given.

The problem of the poor cow, W. J. FRAZER (*Illinois Sta. Circ. 114, pp. 8, figs. 3*).—The records of different cows in the same herd are compared in such a way as to show the wide differences commonly found in productive capacity, the purpose being to interest dairymen in the testing of their cows and increase their profits by weeding out the poor ones.

Why and how to test dairy cows, W. J. FRASER (*Illinois Sta. Circ. 115, pp. 12, figs. 4*).—The improvement accomplished by weighing and testing milk and by other progressive methods in conducting a dairy is described and illustrated by concrete example, and explicit information is given regarding the weighing and testing of milk for the purpose of determining good and poor cows.

Milk supply of Kentucky—Louisville, R. M. ALLEN (*Kentucky Sta. Bul. 134, pp. 75–323, pls. 20, dgm. 1*).—The results of the inspection of a large number of Kentucky dairies supplying milk to Louisville are reported. The introduction to the bulletin comments upon the conditions that were found and the efforts that were made for improvement. Some discussion is also given of tuberculosis in dairy animals, certified milk, and the significance of the score card as a factor in the improvement of market milk.

Dairy practice at Kenai Station, P. H. ROSS (*Alaska Stas. Rpt. 1907, pp. 62–73*).—An account is given of the establishment of a dairy herd at the station and of the methods followed in dairy work, including details regarding the care of the cows and calves, a description of the dairy equipment employed for butter making and for cheese making, and a discussion of dairy practice. The natural advantages of the region for dairying are briefly set forth.

The origin of the turnip taste of butter, H. WEIGMANN (*Landw. Jahrb., 37 (1908), No. 2, pp. 261–309*).—The milk from cows fed on turnips has a peculiar odor and taste. Apparently some volatile product from the turnips gets into the body fluids of the cow and thus affects the milk. This fault may be corrected by warming or aerating the milk. But besides this, certain organisms, as coli bacteria, *Actinomyces odorifer*, *Penicillium brevicaule*, and lactic-acid bacteria, which are found in the feces of cows fed on beets or turnips, also produce the turnip flavor and aroma in butter made from milk or cream in which they are present. The turnip taste of butter may be due to both of these causes together. Butter may have the turnip flavor and aroma, however, even when no turnips are fed, as coli bacteria causing the taste are found also on oats, barley, corn, rape, and other feeding stuffs. Pasteurizing the milk, with subsequent aeration, is recommended as a means of preventing the development of the turnip flavor in butter.

Rusty cans and their effect upon milk for cheesemaking, G. A. Olson (*Wisconsin Sta. Bul. 162, pp. 3–12, figs. 2*).—The author has previously shown (E. S. R., 20, p. 80), that various metals have considerable effect upon the action of rennet. In the experiments reported in the present publication the effect of iron rust on rennet action is shown. "Milk was placed in iron dishes and rusty tin pans and was allowed to stand for definite periods of time. The required time for the coagulation of 50 cc. of such milk with a standard solution of 1 cc. of a 1 per cent commercial rennet extract at a temperature ranging from 87 to 88° F., was then observed. Milks kept in glass beakers were run as controls under similar conditions. The time was noted at the moment the milk just thickened." In these tests "it required from 1 to 16.5 minutes longer for the same milk kept in the rusty pan to coagulate than in case of the milk kept in the glass beaker." The acidity of the control milk was always higher than that kept in the rusty cans, but the difference was not great enough to account for the differences in retardation.

"Milk which had been allowed to stand in iron dishes for several hours had a peculiar bluish grey color, indicating the presence of iron in solution. In several instances the amount of iron dissolved in the milk was determined as iron oxid. The maximum quantities of iron dissolved in the milk ranged from 1 to 1½ lbs. for every 1,000 lbs. of milk." The significance of this is shown by consideration of the conditions of the cans in which milk is brought to the cheese factory, and these conditions in America are contrasted with those prevalent in certain sections of Europe.

Varieties of cheese, C. F. Doane and H. W. Lawson (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 105, pp. 5–72*).—This publication comprises a compilation of descriptions and analyses of those varieties of domestic and foreign cheese about which published information could be found by the authors. A list of publications giving the original sources of analytical data is included.

Investigation of commercial rennet preparations, A. Burr and F. M. Berberich (*Chem. Ztg., 32 (1908), No. 25, pp. 313, 314*).—The chemical composition of a number of samples of liquid and powdered rennet preparations is reported and the data are briefly discussed.

The position of the oleomargarine industry in Sweden, A. Larson (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 1–2, pp. 21–29*).—The statistics of the industry during the last 20 years are given and discussed.

The manufacture of oleomargarine in Sweden has gradually increased from 6,000 kg. in 1886 to 14,343,608 kg. in 1906. At the same time the imports decreased from 813,621 kg. in 1885 to 6,296 kg. in 1906, the exports increased from 6,667 kg. to 658,642 kg., and the domestic consumption increased from 806,954 to 13,691,262 kg. The average price obtained for the year has ranged from 72 öre (19.5 cts.) in 1897 to 113 öre (30.5 cts.) in 1902, the mean price for the period given being 91.8 öre (24.8 cts.) per kilo.

The manufacture of starch from sweet potatoes, C. C. McDonnell (*South Carolina Sta. Bul. 136, pp. 7–50, pl. 1, figs. 11*).—The investigations described were undertaken to determine how much starch could be recovered commercially from sweet potatoes and to test the quality of the starch thus obtained for different uses to which starch is put. The discussion includes an account of the method of culture, analyses of the sweet potato, the process of manufacturing starch therefrom and other data. The results are reported of investigations of two years on the manufacture of starch from sweet potatoes and of tests of the starch for commercial purposes in laundry work and in the cotton textile industries.

In the author's opinion "it is practically settled that the starch produced from sweet potatoes is of a high grade and suitable for use in many operations

where a high-grade starch is required. In all of the tests we have had made not a single adverse report has been received."

The pitting or pulping of olives. R. Marcille (*Bul. Agr. Algérie et Tunisie, 14 (1908), Nos. 6, pp. 146–150; 7, pp. 161–168*).—It is stated that removing the pits from the pulp of olives before pressing somewhat improves the quality of the oil, but the increased financial return for such improvement does not pay for the actual cost of the operation.

Vegetable butter, G. Cornalba (*Coltivatore, 54 (1908), No. 16, pp. 487–490*).—Vegetable fat known as karitè, obtained from *Bassia butirracea*, and which is used to some extent as an adulterant in butter, is discussed. The constants given are saponification number 175, iodin number 19, and Reichert-Meissl number 2.6. (See also a note on p. 151 of this issue.)

Extraction of beeswax, F. C. Alford (*Colorado Sta. Bul. 129, pp. 3–14*).—The results of experiments on various methods of extracting beeswax are reported, solar extractors in which the heat of the sun is utilized for melting the wax, three kinds of steam extractors and those employing pressure under water at a temperature sufficiently high to melt the wax, being compared. The latter method was employed using water alone, and also with the addition of diluted sulphuric acid.

Heating with diluted sulphuric acid and pressing under water gave the highest results, the steam extractors giving the next best results and the solar extractors the lowest. The results obtained by the use of the steam extractors were increased somewhat by using artificial heat in connection therewith. In conclusion the author states: "From the results of these experiments and my own experience in handling bees and rendering wax I believe that it is best for the average bee keeper to have a large solar wax extractor, heated by some artificial heat, by means of which most of the wax in the lighter colored combs, cappings, and burr combs may be easily rendered. The dark combs may also be treated in this manner and the slumgum stored in barrels until the bee keeper has time to treat it with dilute sulphuric acid and press under water. This method is quick and efficient. If the wax has to be refined it can be done by heating, while inclosed in a canton flannel sack, with a solution containing 5 per cent of hydrogen peroxid and 2 to 5 per cent of sulphuric acid. Both of these chemicals can be bought at the ordinary drug store. The common kind, commercial, should be used."

Technology of fats and oils, G. Hefter (*Technologie der Fette und Öle. Berlin, 1908, pp. IX+974, pls. 19, figs. 155*).—The second volume of a handbook on the production and preparation of fats, oils, and waxes of plant and animal origin. A rather extensive discussion is included of the history, source, raw materials, preparation, characteristics, uses, and commercial and agricultural importance of these products.

VETERINARY MEDICINE.

Therapeutic technique, W. Schlampp (*Therapeutische Technik. Stuttgart, 1907, vol. 2, pt. 1, pp. 314, figs. 88*).—In the first volume of this work (E. S. R., 17, p. 1111), a discussion was given of the therapeutic methods applicable to the skin of domestic animals. In the present volume a discussion is given of the therapy of the alimentary tract. The subject matter is classified according to the part of the alimentary tract to which the various medicines are to be applied. The methods discussed by the author include washes and applications by means of a brush to the mouth and pharynx and the various means of giving medicines by way of the mouth.

Veterinary hygiene, S. J. Bonansea (*Papers and Rpts. Amer. Pub. Health Assoc., 32 (1906), pt. 1, pp. 320–324*).—Attention is called to the many animal diseases which may be transmitted to man through the agency of milk or other animal products, or by direct contagion. In protecting man against these sources of disease the author recommends the establishment of international laws of veterinary sanitary police and that all countries should take special steps in the strict enforcement of milk and meat inspection and in supervising the traffic in animals.

Annual report of the State board of live stock commissioners of Ohio, T. L. Calvert and P. Fischer (*Ann. Rpt. Bd. Live Stock Comrs. Ohio, 6 (1907), pp. 48, figs. 18*).—During the year under report, attention was given chiefly to glanders, sheep scab, and the control of shipments of southern cattle. In addition to this work, 32 dairy herds were tested for tuberculosis. In a total of 911 cows, 33 per cent proved to be tuberculous. It is known that a large number of animals are privately tested and at present there is no means of ascertaining what is done with cattle found to be tuberculous in these tests. The situation with regard to glanders in Ohio is improving. Attention is called to the great economic importance of this disease in horse-raising localites.

Special statements were given regarding the prevalence and distribution of anthrax, actinomycosis, venereal disease in horses, foot rot, glanders, hog cholera, nodular disease in sheep, rabies, mange, tuberculosis, etc.

Annual report of the civil veterinary department, Bengal, and of the Bengal veterinary college, 1906–7, E. A. Gait (*Ann. Rpt. Civ. Vet. Dept. and Bengal Vet. Col., 1906–7, pp. 14*).—A summary statement is made regarding instruction at the Bengal veterinary college, the work of the bacteriological laboratory, and other veterinary investigations. A collection is being made of the biting flies of Bengal, particularly species of Tabanus, Stomoxys, Lyperosia, and Hippobosca. During the year under report, considerable demonstration work was carried out in the treatment of glanders, rinderpest, hemorrhagic septicemia, and other diseases. An attempt is also being made to improve the quality of native cattle and horses.

Annual report of the imperial bacteriologist, 1906–7 (*Calcutta: Govt., 1907, pp. 27*).—It is stated that rinderpest serum preserved during two hot seasons lost about 60 per cent of its protective power. Serum prepared during an unusually cold winter was much weaker than ordinary serum. The elephant has been shown to be immune to rinderpest.

A test was made of atoxyl in treating horses, mules, and rats for trypanosomiasis. In the Plains region 8 gm. of atoxyl per 400 lbs. of body weight caused only slight symptoms of colic in mules, while at greater altitudes the same quantity of atoxyl sometimes produced fatal results within 85 hours. Extensive tables are given showing the amount of rinderpest serum, mallein, and other preparations made and distributed during the year.

Morphological changes in the spleen after infection in animals passively immunized, A. Jarotzky (*Arch. Path. Anat. u. Physiol. [Virchow], 191 (1908), No. 1, pp. 112–135*).—In the experiments reported in this paper white mice were chosen as the experimental animals and the bacillus of swine erysipelas as the pathogenic organism. The mice received a hypodermic injection of 0.3 cc. serum and culture to which 0.4 cc. physiological salt solution had been added. A parallel series of mice was inoculated with the culture of the bacillus of swine erysipelas without having been treated with serum. In studying the pathological changes in the spleen, microscopic sections were made through the whole structure of this organ. In mice inoculated with the bacillus of swine erysipelas and not treated with serum the cortical layer of the spleen was hyperemic and showed a large number of cells in division and also

giant cells. In addition to these changes the author observed many acidophile granulations and horse-shoe-like free nuclei.

In mice which have been previously treated with serum essentially the same changes were observed but in much less marked form.

The latency of tetanus spores in the animal organism, M. Canfora (*Centbl. Bakt. [etc.], 1. Abt., Orig., 45 (1907), No. 6, pp. 495–501*).—If an infection with tetanus is produced in the animal organism, tetanus cultures may be obtained from the blood after death. This demonstrates that the tetanus bacillus may become widely distributed throughout the organism. If tetanus cultures are heated to a temperature of 70 to 75° C. to destroy the toxin and vegetative form of the bacillus and then inoculated subcutaneously, the spores become distributed throughout the organism and may be found in the blood within a few hours. During the first 10 to 13 days they are found in the blood circulation, after which they may occur in the liver, spleen, kidneys, bone marrow, lymphatic glands, etc., where they persist in a latent state. In the later stage the blood is sterile. The spores may create an infection by coming in contact with a wound produced after inoculation. Apparently the spores are not excreted by the kidneys but are destroyed by the animal organism.

The relation of the mouse typhoid bacillus to the system of typhoid coli bacilli, P. Lotzer (*Über die stellung des mäusetyphusbacillus im system typhus-coli. Inaug. Diss. Univ. Bern, 1907, pp. 33*).—From the experience of the author and other investigators, it appears necessary to observe considerable care in the use of cultures of mouse typhoid bacilli for the purpose of eradicating these animals. In Japan and elsewhere serious consequences have resulted to human beings from the careless use of cultures of mouse typhoid bacilli. In one instance 120 persons were affected and in another 30 suffered a fatal infection from these bacilli. The observations of the author indicate a very close relationship between the bacillus of mouse typhoid, the paratyphoid bacillus, and the bacillus of meat poisoning.

The pathogenic effects of human viruses, L. Cobbett (*Roy. Com. Tuberculosis, Second Interim Rpt., 2 (1907), pt. 2, App., pp. VII + 1217, pls. 26*).—Systematic experiments were carried on with tubercle virus obtained from 63 human patients. During the progress of the experimental work the virus was tested on cattle, rabbits, guinea pigs, goats, pigs, apes, monkeys, dogs, cats, rats, mice, and fowls. The history of each strain of virus is given in detail and the clinical lesions produced in the various experimental animals are elaborately presented. The illustrations used in this connection are of striking excellence. The methods of infection employed included both injection and feeding.

In the majority of cases injections were made both with emulsions of tuberculosis tissue and with cultures. The emulsions were made as a rule from human tuberculous lesions, but when such material was not available in sufficient quantity, guinea pigs were first injected and emulsions were prepared from their tuberculous tissue. Careful estimates were made of the number of tubercle bacilli contained in the doses of emulsion. As a result of the long continued experiments reported by the author, it seems necessary to differentiate quite sharply between two classes of human tubercle bacilli, one of which in doses of the usual size produces rapidly fatal generalized tuberculosis in calves and various other animals, while the other class of virus causes only localized or minute lesions even when injected in large doses. The more virulent type of tubercle bacilli was found capable of producing generalized tuberculosis in cattle, goats, pigs, monkeys, chimpanzee, rabbits, guinea pigs, and dogs. Cats appeared to be somewhat more resistant and no infection was caused by inoculation of fowls.

The pathogenic effects of bovine viruses, A. S. GRIFFITH (*Roy. Com. Tuberculosis, Second Interim Rpt., 1 (1907), pt. 2, App., pp. 711, pls. 17*).—Since 1903, the author has carried on continuous observations in the study of the biology and pathogenic relations of tubercle bacilli of bovine origin. An elaborate system of technique was devised for the estimation of the number of tubercle bacilli present in cultures. In arriving at an estimate of average results along this line, 139 counts were made. The calculation is admittedly imperfect but indicates clearly that the great majority of culture inoculations are richer in tubercle bacilli than inoculations with even the largest doses of tissue emulsions. It is estimated that each cubic millimeter of the culture contains from 4,000,000,000 to 5,000,000,000 tubercle bacilli.

In the experimental work carried on by the author, bovine tubercle bacilli were inoculated into cattle, goats, pigs, apes, monkeys, dogs, cats, rabbits, guinea pigs, etc. Inoculation was accomplished by the intravenous, intraperitoneal, intramammary, and subcutaneous methods and also by feeding. The purpose of the feeding experiments with bovine tubercle bacilli was to ascertain the relative susceptibility of different species of animals to this mode of infection and to study the distribution of tuberculosis lesions thus produced. In these experiments, 318 animals belonging to 15 distinct species were used. The majority of the animals were fed single doses of tubercle bacilli either in the form of a culture or in tuberculous milk. Some of the experimental animals were fed at intervals for varying periods with tuberculous milk.

It appears that in cases where animals are fed a single dose of tubercle bacilli there may be many individual factors which greatly influence the result. For example a catarrh of the mucous membrane of the intestines may protect the animal from infection by hastening the expulsion of the intestinal contents. Tubercle bacilli are readily absorbed from the alimentary canal of pigs but much less rapidly in the case of guinea pigs. Individual susceptibility exercises an important influence on the result. The chimpanzee, baboon, rhesus monkey, lemur, rabbit, and guinea pig are highly susceptible to the action of bovine tubercle bacilli, and infection from however small a dose is almost invariably followed by progressive tuberculosis. In the pig, goat, calf, cat, and dog, on the other hand, with the possible exception of the young pig, tuberculosis produced by feeding may be limited to the glands along the alimentary tract, particularly if the dose of tubercle bacilli is small. In young pigs tuberculosis is usually of a progressive type. Adult swine are, however, somewhat more resistant.

The infection of the organism with general tuberculosis of the lungs from the subcutaneous connective tissue, blood, and alimentary tract, A. D. PAWLOWSKY (*Ztschr. Tuberkulose, 12 (1908), No. 1, pp. 31–45*).—The author's experiments have been carried on since 1903 and have consisted largely in feeding guinea pigs human tubercle bacilli in milk. The guinea pigs were then killed after a lapse of 1 to 3 or more weeks and carefully examined to determine the extent and distribution of tuberculous infection. The experiments show that tuberculosis in the early stages is confined almost entirely to the lymphatic glands while the stomach and intestines are unaffected. The tubercle bacilli pass through the walls of the alimentary tract without causing any lesions in it and remain for some time in the mesenteric glands. From these points they may be carried through the lymphatic system and after a period of from 6 to 8 weeks may appear in the lungs.

Morphological variation in the tubercle bacillus, S. ARLOING (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 3, pp. 100–104, figs. 3*).—Under artificial conditions obtained by modification of the nutrient media, temperature, etc., it was

found possible to cause morphological changes in tubercle bacilli obtained from different sources. Thus the giant branched and club-shaped forms were found not to be characteristic alone of the tubercle bacillus obtained from birds. These forms are found not only in old cultures of mammalian tubercle bacilli but may be observed in fresh cultures subjected to the influence of an elevation of temperature or of the pressure of 2½ atmospheres. The author considers that his work has thrown in question the boundary lines which have been proposed between the forms of tubercle bacilli observed in man, animals, and birds.

Tubercle bacilli in the meat and apparently healthy lymphatic glands of tuberculous animals, J. Y. Swierstra (*Kommen in dem Fleische und in makroskopischen gesunden Lymphdrüsen von tuberkulösen Tieren Tuberkelbazillen vor? Inaug. Diss. Univ. Bern, 1906, pp. 76*).—In testing the meat and macroscopically normal glands of tuberculous animals for the presence of tubercle bacilli, positive results were obtained in a number of cases both in cattle and hogs. On the basis of these experiments the author recommends that the meat of tuberculous animals should be sterilized in all cases showing a high degree of emaciation, extensive soft foci, fresh infection of the blood, or localization of the tuberculous process in the bones.

Ophthalmo-reaction to tuberculin, H. Vallée (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 3, pp. 146–148*).—In experiments with this method of diagnosing tuberculosis the author obtained satisfactory results. The position is taken that by means of the ophthalmo-reaction a rapid test is furnished which will assist greatly in detecting frauds which are attempted in the sale of breeding animals.

The influence of cerebral traumatism on the reaction of the normal guinea pig to tuberculin, A. Slatineano and D. Danielopol (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 2, pp. 89, 90*).—The direct injection of tuberculin into the cerebrum of guinea pigs produces an elevation of temperature to the extent of 1.5 to 2.5° C. within 1 or 2 hours. Experiments in producing slight injuries in the cerebrum indicate that guinea pigs thus treated are highly susceptible to the action of tuberculin applied subcutaneously if the injection is made not less than 6 days after the traumatism.

Immunity toward tuberculosis, S. I. Métalnikoff (*Arch. Sci. Biol. [St. Petersb.] 13 (1907), No. 2, pp. 169–206*).—The experiments of the author with the bee moth have shown that this insect is naturally immune to tuberculosis of warm-blooded animals. Human and bovine tubercle bacilli inoculated into bee moths are quickly surrounded and destroyed by the leucocytes. When bee moths are inoculated with tubercle bacilli from fish the bacilli are rapidly surrounded by the leucocytes but later they begin to multiply inside of the leucocytes and finally escape into the body fluids causing the death of the bee moths within 3 or 4 days.

On the basis of these observations a number of immunization experiments were made chiefly with guinea pigs. It appears necessary in producing immunity to tuberculosis to induce in the blood serum the power of disintegrating the waxy membrane of tubercle bacilli. This may be accomplished to some extent at least by injecting animals with wax obtained from tubercle bacilli after freeing it from other substances. This material possesses immunizing power.

A plan for eradicating animal tuberculosis, B. Rogers (*Manhattan, Kans., [1907], pp. 16*).—In this pamphlet the author presents a statement of the manner in which tuberculosis is ordinarily transmitted from animal to animal and from animal to man. Particular attention is given to the extensive infection of hogs with tuberculosis as shown by recent statistics from meat inspection. Tuberculosis of swine is apparently due to the ingestion of the tuberculous

products of cattle and other animals. It is maintained that the great majority of cases of tuberculous animals are at present produced on not more than 6 per cent of the farms of the country. If animals sent to slaughterhouses were so tagged as to show their origin in all cases, it would be a simple matter to locate these centers of tuberculous infection and apply suitable means for the complete eradication of tuberculosis.

The dissemination and control of tuberculosis as illustrated in the bovine species, V. A. Moore (*Proc. Ann. Conf. Sanit. Off. N. Y., 7 (1907), pp. 34–49*).—A historical review is given of the development of knowledge concerning tuberculosis. Tabular data are presented showing the present status and prevalence of the disease in various parts of New York. Particular attention is devoted to a consideration of the methods of Bang and von Behring in the control of the disease. Von Behring's method is considered as still in the experimental stage. The method has failed in many instances and the duration of immunity is not yet determined with sufficient accuracy.

The diagnosis of blackleg, Warringsholz (*Berlin. Tierärztl. Wchnschr., 1908, No. 4, pp. 65, 66*).—As a rule, diagnosis in the case of blackleg is an easy matter. Occasionally, however, some difficulty is experienced. In a study of the pathological anatomy of blackleg the author found small gray foci in the cortical layer of the kidneys. These structures were sometimes isolated and sometimes in groups. In the center of each structure a minute quantity of gas is accumulated. Blood clots were found in the heart in every case of blackleg.

Bacillus pyogenes bovis and B. pyogenes suis in relation to chronic inflammation of the lungs of cattle, H. C. L. E. Berger (*Vergleichende untersuchungen über den Bacillus pyogenes bovis und den Bacillus pyogenes suis mit beziehung derselben zu den chronischen lungenentzündungen des rindes. Inaug. Diss. Univ. Bern, 1907, pp. 84, figs. 5*).—According to extensive investigations of the author in cultivating and testing the pathogenic properties of *Bacillus pyogenes bovis* and *B. pyogenes suis*, it appears that these organisms commonly occur in chronic cases of broncho-pneumonia of cattle, either alone or associated with other bacteria. *B. pyogenes* is capable of producing both suppurative and metastatic broncho-pneumonia in cattle. The lesions thus produced may lead to a mistaken diagnosis of tuberculosis, in fact the author claims that cattle in which the lungs are infected with *B. pyogenes* may react to tuberculin.

The occurrence and frequency of streptococcic mammitis in cows, G. Rühm (*Wchnschr. Tierheilk. u. Viehzucht, 52 (1908), Nos. 7, pp. 125–130; 8, pp. 147–152*).—It was found possible to detect by the examination of milk the presence of streptococcic mammitis before the disease was apparent from palpation of the udder or from the ordinary methods adopted in milk inspection. The method used by the author in the detection of the disease was that proposed by Trommsdorff for the determination of leucocytes in milk.

Tick fever in cattle, C. J. Pound (*Queensland Agr. Jour., 20 (1908), No. 1, pp. 26–35, pls. 2*).—Detailed directions are given covering the technique of preventive inoculation of cattle in the control of Texas fever and East Coast fever.

Sheep dips, O. Quibell (*Jour. Soc. Chem. Indus., 26 (1907), No. 24, pp. 1266–1268*).—The basis for the present article on sheep dips is the experience of the sheep raisers in the English colonies, particularly Australia and New Zealand, with various kinds of dips in the eradication of scab.

It was found that the lime-sulphur dip is an undoubted cure for scab, although it sometimes fails to cure other parasites of sheep. Australian and New Zealand governments, however, finally came to the conclusion that the low price of their wool was to be ascribed to the use of lime and sulphur. Accordingly the

sheep raisers gave up the use of lime and sulphur in favor of arsenical and carbolic dips.

Arsenical dips when properly prepared are claimed to be very efficient scab remedies and also act as a stimulant to the wool. In the arsenical dips at present used care is exercised to prevent any astringent or caustic properties. It is held that the good effect of arsenical dips upon the quality of the fleece is proved by the high prices which are paid for wool from sheep treated in this manner. Carbolic dips are also effective, but the action of the dip does not persist as long as is the case with arsenical dips.

Bacillus pseudotuberculosis in hogs, Sérès and Guillaume (*Rev. Gén. Méd. Vet., 11 (1908), No. 123, pp. 127–131*).—*Bacillus pseudotuberculosis* is known to have a wide distribution and to cause more or less serious disease in horses, cattle, sheep, and various laboratory animals. According to the authors, however, it has not previously been reported in hogs. A number of cases have been observed by them in abattoirs, but the symptoms of the disease during life have not been studied. In one case it was reported that a hog had symptoms similar to those of rachitis. The characteristic lesions of *B. pseudotuberculosis* were observed in various parts of the body, and cultures were obtained which reproduced the disease in guinea pigs.

The hygiene and internal diseases of the horse, L. Morisot (*L'Hygiène et les Maladies interne du Cheval. Paris, 1907, pp. 472, figs. 49*).—The present treatise on the hygiene and diseases of the horse is written from the standpoint of the practitioner, especially the army veterinarian in the field service. The volume includes an account of the general principles of hygiene as applied to the horse and of the common diseases to which the horse is subject, these being arranged under the organs or parts affected. Special chapters are also devoted to contagious diseases and to the problem of disinfection.

Seborrhoic eczema in horses, H. Bang (*Maanedskr. Dyrlager, 19 (1907), No. 8, pp. 303–317*).—The literature relating to this form of eczema is critically reviewed. The author made a careful study of one case in which the disease was found to consist in a pathological inflammation of the oil glands of the skin. The sweat glands were not affected. In some of the diseased oil glands a leucocytosis was observed, but it is believed that this condition was secondary.

Ophthalmo-reaction in glanders, A. Wladimiroff (*Berlin. Tierärztl. Wchnschr., 1908, No. 3, pp. 50–52*).—As a result of his experience in this method of testing for glanders, the author comes to the conclusion that in large herds of horses the ophthalmo-reaction furnishes a means of quickly eliminating the animals which are beyond suspicion. It is held that all animals which do not react may be considered as healthy and do not require a subcutaneous injection of mallein. A considerable expense is thus saved and the work of eradicating glanders from a herd of horses is rendered more easy.

Hepatic hemorrhage as a result of amyloid degeneration in horses, E. Noyer (*Über Leberblutungen infolge Amyloiddegeneration beim Pferd. Inaug. Diss. Univ. Bern, 1907, pp. 47*).—The literature relating to this subject is critically discussed in connection with bibliographical references. The author had opportunity to follow the clinical history of 8 cases of amyloid degeneration of the liver. These cases all occurred in horses which were used for the preparation of diphtheria antitoxin and the disease appears to be connected with this process. The length of time required for the development of experimental amyloid degeneration has not thus far been determined.

The etiology of fowl plague, S. Prowazek (*München. Med. Wchnschr., 55 (1908), No. 4, pp. 165, 166, figs. 2*).—According to the investigations of a number of authors the virus of fowl plague must be considered as ultramicroscopic. It

is largely thrown out of the blood by subjection to vigorous centrifugalization. After this treatment the virus is found associated with the corpuscular elements of the blood. The virus of fowl plague obtained from the brain is not destroyed by saponin during an exposure of 1 hour. Apparently the virus has the power of passing through the finest filters. In most cases, minute corpuscles were to be observed which may be the organism of the disease.

Coli-septicemia in fowls as a disease which occurs during transportation, L. Claussen (*Über Kolibakteriensepticämie bei Hühnern als Transportkrankheit. Inaug. Diss. Univ. Bern, 1907, pp. 30, pl. 1*).—The coil bacteria which are frequently found in the intestines of healthy fowls may become so modified by unfavorable conditions which occur during transportation as to produce a serious form of septicemia. The virulence of these organisms may be artificially increased by several inoculations of canary birds. The mortality from this form of septicemia is not greater than 50 per cent. The disease may be transmitted by inoculation or by feeding, and the incubation period is about 12 hours.

Infectious inflammation of the air sacs in geese, G. Bugge (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 3 (1908), No. 5, pp. 470–480, fig. 1*).—An outbreak of an apparently new disease among geese was observed by the author and a study was made of the origin and etiology of the disease. It was apparently introduced with geese imported from Russia. Affected birds show a condition of emaciation. The air sacs, particularly those in the body cavity, are of a yellowish color and upon the inner surface whitish yellow masses of exudative origin are to be observed. Similar conditions are noted upon the serous covering of the liver, spleen, intestines, and kidneys. In some cases the outer covering of the stomach is likewise affected. In the blood of diseased birds, bacteria were found and pure cultures were made. The organism in question produces no effect in hens when injected into them and this test may be used as a means of arriving at a differential diagnosis between fowl cholera and infectious inflammation of the air sacs. The latter disease appears to be confined strictly to geese, as ducks and pigeons, as well as common fowls, proved to be refractory. No satisfactory method of treatment or prevention has been devised.

The penetration of toxins from parasitic worms into the body of the host, Weinberg (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 1, pp. 25–27*).—According to the author sclerostomum, esophagostomum, and other parasites may secrete substances which become absorbed by the host and constitute a part of the toxic symptoms observed in cases of infestation by the parasites in question.

Feeding stuffs poisonous or injurious for animals, R. Dumont (*Prog. Agr. et Vit. (Ed. l'Est), 28 (1907), Nos. 48, pp. 658–661; 50, pp. 722–726; 51, pp. 756–760; 52, pp. 778–781*).—Attention is given to a brief consideration of species of Euphorbia, wild mustard, and various other wild plants, including rhododendron, aconite, and digitalis which have been found to be poisonous to stock. Mention is made of the poisonous effects sometimes produced by cultivated plants such as sorghum, lupines, potatoes, tobacco, and various species of beans. The author also discusses briefly the unfavorable results which may follow the use of cotton-seed meal, fermented molasses, and other commercial feeding stuffs.

The effect of digitalis and its glucosids upon various ruminants, A. Salvisberg (*Ueber die wirkung von digitalis und digitalisglykosiden auf den organismus verschiedener wiederkäuer. Inaug. Diss. Univ. Bern, 1907, pp. 46*).—The author's experiments were carried out on sheep, goats, and cattle. In these experiments it was found that the leaves of digitalis could be given to ruminants without producing any apparent effect. Cows received doses which would be fatal for horses without giving any reaction whatever. The conclusion is

reached that the active principles of digitalis are so changed or destroyed in the stomach of ruminants that they have no pharmaceutical action upon the organism. Digitalis given by intravenous injections, however, exercises the same effect as upon other mammals.

RURAL ECONOMICS.

The agrarian question in the German economic system to the middle of the nineteenth century, E. Cronbach (*Das landwirtschaftliche Betriebsproblem in der deutschen Nationalökonomie bis zur Mitte des XIX. Jahrhunderts. Vienna, 1907, pp. XII+338*).—This book gives a historical and critical study of the problems relating to farm management and land ownership in Germany beginning with the sixteenth century.

The agrarian social problem in Spain, del Retamoso (*Crónica del Curso Breve de Cuestiones Sociales Celebrado en Madrid, 1906. Madrid, 1907, pp. 118–161*).—This is a series of three lectures delivered in Madrid in 1906 and entitled as follows: (1) Determination of its distinctive characters in the different districts of Spain; (2) agricultural crises and their causes; and (3) a critical examination of proposed remedies and a study of principal solutions. An extensive bibliography is appended.

[Papers relating to rural economics] (*Rpt. Brit. Assoc. Adv. Sci., 1907, pp. 597–603*).—Summaries of papers on the following subjects read at the annual meeting of the British Association for the Advancement of Science at Leicester, July 31 to August 7, 1907, are reported:

Small occupying ownerships, J. Collings (pp. 597–599).—This is a plea for the establishment of the British land system on the basis of occupying ownership. To facilitate the scheme proposed the author advocates (1) a better system of rural education and (2) the establishment of cooperation among cultivators for both buying and selling. The creation of a class of small owners it is believed would solve the grave social problems of the unemployed, housing, and widespread destitution, and "to pledge the national credit for the purpose of carrying it out would be in accordance with the principles of a sound national and political economy."

The importance of the distinction between (1) subsistence farming and (2) producing for a market in connection with small holdings, W. Cunningham (pp. 599, 600).—As compared with large farming it is believed the small holder who tries to make a living from his land without other source of income is liable to fail. But, if allotments and small holdings can be combined with opportunities of wage-earning, so that the land is used to provide a portion at least of the means of subsistence, it would tend to improve greatly the material welfare of the artisan class.

Some notes on the small holdings of Worcestershire, Kirkaldy (pp. 600, 601).—A brief sketch of the history and methods of working of small holdings in this county which was the pioneer in the movement in England. The results show the value of a committee of practical men to foster the movement, to train the small holder, and to apply the principles of cooperation. The question of assessment requires thorough revision.

Agricultural cooperation in Great Britain, R. A. Yerburgh (pp. 601–603).—Noted from another source (E. S. R., 19, p. 587).

Small holdings in Hampshire, J. C. Newsham (*Jour. Bd. Agr. [London], 15 (1908), No. 2, pp. 83–94*).—This article sets forth the opportunities the county of Hampshire, England, affords to the small holder as regards labor, soil, and markets, gives the economic returns of various types of holdings, and shows that failures occurred "among those who possessed limited capital and a still

more limited knowledge of agriculture, with little or no idea of how to manage the holding."

In view of the government's recent efforts to encourage the increase of small holdings, the author maintains that "the success or failure of additional small holdings in this county will depend to a great extent on the system of cooperation adopted. If an enlightened cooperative movement could be fostered and made a success, there is no doubt that many districts, where produce can not under present conditions be satisfactorily marketed, would become flourishing and prosperous, to the advantage not only of the occupier and the county, but also of the nation as a whole."

The English peasantry and the enclosure of common fields, G. SLATER (*London, 1907, pp. XIII+337, pls. 9*).—This book gives a history of common field enclosure in England, with particular reference to the effects of the movement upon agricultural production, increase of rent, rural depopulation, industrial development, increase of pauperism, national resources, etc.

Some reflections upon the reassignment of small farms, A. RAEYMAECKERS (*Ann. Gembloux, 18 (1908), No. 6, pp. 367–372*).—This article describes how the present system of small farms owned by the peasant classes in Belgium consists generally of a number of small, noncontiguous pieces, and shows how this system in many ways interferes with the effectiveness of agriculture and the welfare of the landowners. The author outlines by means of statistics and discussion derived from the experience of Denmark the economic and social advantages which would accrue to the peasantry as a result of a reassignment of land under government supervision of a single allotment as nearly equal as possible in extent, fertility, and market facilities to the present numerous small parcels.

The law of April 10, 1908, relating to small holdings and cheap houses (*Jour. Agr. Prat., n. ser., 15 (1908), No. 17, pp. 530, 531*).—This is the text of the law which provides for the advancement by the French government of a sum not to exceed 100,000,000 francs for the purpose of enabling the poorer classes of peasants to acquire land, to improve their dwellings or to construct new ones, and to increase the size of their holdings, and for the management of the property in case of the decease of the owner. The funds are advanced at 2 per cent interest to local credit societies, through which the peasants are to transact business, and the societies are prohibited from charging borrowers more than 4 per cent interest.

The holdings of agricultural laborers, F. CONVERT (*Rev. Vit., 29 (1908), No. 749, pp. 467–470*).—This article briefly reviews the efforts of various countries to enable agricultural laborers to become property owners and discusses the law noted above. The author believes the law will enable the poorer classes of peasants to improve the social and economic welfare of their families by increasing their incomes and will greatly encourage the rural population to remain on the land.

The opportunity of acquiring property afforded the agricultural laborer, P. ANTOINE (*Jour. Agr. Prat., n. ser., 15 (1908), No. 17, pp. 528, 529*).—An article similar to the above.

Mutual agricultural credit, P. DECHARME (*Semaine Agr. [Paris], 27 (1908), No. 1399, p. 85*).—This is a review of the development of mutual agricultural credit banks in France, with a discussion of the aims and results of the movement. The mutual credit societies at the beginning of 1908 numbered about 2,000, had 100,000 members, and had advanced in loans to poor peasants during the past 7 years no less than $40,000,000, at interest from 3½ to 4 per cent. The author maintains that there were 33,000 rural communes in France which had not yet put the plan of mutual credit into operation.

Mutual credit and agricultural improvement, F. Virgili (*Bol. Quind. Soc. Agr. Ital., 13 (1908), No. 9–10, pp. 333–343*).—The author gives a brief review of the origin and development of mutual agricultural credit in Italy and discusses its effects upon mortgage indebtedness, statistics of which by provinces, square miles of territory, and per capita are presented. The efforts of the government by legal enactments to improve agricultural conditions by assisting the small farmer to secure credit and to give mutual credit a more economic efficacy and judicial flexibility are also discussed.

Agricultural credit, de Eza (*Crónica del Curso Breve de Cuestiones Sociales Celebrado en Madrid, 1906. Madrid, 1907, pp. 163–217*).—This is a course of three lectures delivered in Madrid in 1906. The article discusses the character and nature of agricultural credit, describes the development of the Schulze-Delitzsch, Raiffeisen, and other mutual credit banks, and gives a brief account of the legal status and present development of agricultural credit in Spain.

Agricultural labor, Hitchins (*Jour. Dept. Agr. West. Aust., 16 (1908), No. 3, pp. 219–221*).—The scarcity of farm labor in Western Australia and the efforts of the government labor bureau to supply the demand are discussed. "The demand at present for experienced farm hands is greater than the supply at wages ranging from 25s. to 30s. per week and keep." The increasing settlement of the country is creating a steady and assured demand for country workers, and work on farms is believed to offer a partial solution of the problem of the unemployed in Perth and other cities of the province.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 8, pp. 57–64*).—The usual statistics and notes on the condition, values, and prices of principal crops in the United States and Europe are reported, including a tabulated statement of the exports from the United States of farm and forest products during the years ended June 30, 1907 and 1908.

[Agricultural statistics of the Netherlands] (*Jaarc. Koninк. Nederlanden, Rijk Europa 1906, pp. 148–162*).—Statistical data for 1906 compared with preceding years of acreage and yields of crops, extent of land cultivated by proprietors and tenants, number and size of farms, live stock, agricultural machinery, etc., are reported.

AGRICULTURAL EDUCATION.

The next step in agricultural education, E. Davenport (*Urbana, Ill., 1907, pp. 22*).—This is primarily an argument against special agricultural high schools and in favor of teaching agriculture in existing high schools. The writer argues that separate schools can never be so good, that they will tend strongly to peasantize farmers, prevent the natural flow of individuals from one profession into another, require students to board and room away from home, and injure the development of existing high schools, and that it is unnecessary to found separate schools in order that agriculture shall be well taught. He believes that agriculture should be given a large and important place in existing high schools, and that as rapidly as sentiment in favor of such teaching crystallizes, the schools will prepare to meet the demand.

The township high schools of Ohio, A. B. Graham (*Agr. Col. Ext. Bul. [Ohio State Univ.], 3 (1908), No. 6, pp. 20, figs. 24, dgms. 2, map 1*).—The author gives a historical sketch of the development of township high schools in the State, with data concerning tuition, classes of high schools, courses of study, equipment, cost of buildings and supplies, and bequests to some of the high schools.

Instruction in practical agriculture upon the university farm at Davis (California) (*California Sta. Circ. 37, pp. 12*).—This is an announcement of

farmers' short courses for 1908 as follows: Dairy manufacture, 8 weeks; irrigation, soils, forage crops, and cereals, 3 weeks; poultry husbandry, 8 days; animal industry and veterinary science, 4 weeks, and horticulture and viticulture, 3 weeks.

Southern agriculture, F. S. EARLE (*New York, 1908, pp. VII+297, pls. 10, figs. 36*).—Under part 1 this book considers climate, soil, cultivation, plant growth, insects and diseases of plants, marketing, and farm management, and under part 2 it gives cultural directions for the chief southern agricultural crops, including discussions on forestry and domestic animals. The book does not confine itself to the agriculture of the Southern States but also treats of tropical and subtropical crops, including fiber plants, coffee, cacao, rubber, nuts, and fruits.

Agriculture for Southern schools, J. F. DUGGAR (*New York, 1908, pp. 355, figs. 188*).—This is an elementary text-book of agriculture which deals with general principles underlying the subject, but uses largely the materials of Southern agriculture for purposes of illustration and study.

Beginning with the plant in flower, the process of pollination, propagation from seeds, and the relations of moisture and plant food to plant growth, the text recurs to the propagation of plants by means of buds, following this with lessons on the improvement of plants, the formation of soil, the relation of the crop to the soil, moisture in the soil, and soil management, including such topics as cultivation, terracing, draining, deterioration and improvement, the use of barnyard manure and commercial fertilizers, and the rotation of crops. The remaining chapters deal in logical order with field and garden crops, the flower garden, forest trees, orchard fruits, plant diseases, insect friends and enemies (with an entire chapter on the cotton-boll weevil, one on insects and health, and one on the honeybee), animal husbandry (horses, cattle, sheep, swine, and poultry), the feeding of animals, the production of milk and butter, farm implements and machinery, roads, and the principal soils and crops of Alabama. Formulas and tabular matter are arranged in an appendix.

Elements of agriculture, W. C. WELBORN (*New York, 1908, pp. XVI+329, pl. 1, figs. 109*).—This is a text-book of elementary agriculture prepared especially for use in the public schools of the South and West. It deals first with the plant and its environment, then with the botany of field crops, propagation, seed selection, and methods of growing crops and maintaining fertility. Special crops are then taken up, like cotton, corn, rice, sweet potatoes, legumes, orchard crops, and truck crops, followed by the feeding of animals, the making of a ration, animal diseases, animal husbandry, raising horses and mules, cattle, sheep, goats, poultry, and bees, and dairying.

An appendix contains a botanical classification of important economic families of plants, a chapter on the treatment of plant diseases with formulas for different spray solutions, a list of harmful insects and remedies, score cards for judging live stock, stock diseases and remedies, and a glossary.

Agriculture in the elementary schools, M. J. ABBEY (*State Normal School, Mayville, N. Dak., Quart. Bul., 5 (1908), No. 4, pp. 48*).—This is an outline course in agriculture for the public schools, beginning with the first grade and extending through the high school. It may be put into the hands of pupils but is more properly a teacher's guide. It is divided into 3 sections, the first dealing with suggestions to the teacher, the second with outlines for the first 6 grades, and the third with outlines for the grammar grades and the high school. In the first 4 grades the work is arranged by years and classified under such headings as plants, animals, weather, machinery, soil and farm problems. In the fifth and sixth grades the more definite study of plants is taken up, together with conditions necessary for plant growth, and this is

followed in the grammar grades and the high school with studies of the soil, the atmosphere, seeds, plant production (wheat, corn, grasses, flax, weeds, horticulture, and plant breeding), farm animals, birds and insects, the school garden, and reference books.

Rural school agriculture, C. W. DAVIS (*New York, 1907, pp. 267, figs. 74*).—This is a series of 142 exercises in agriculture prepared for the use of students of agriculture who expect to become teachers, and for those in rural districts who expect to continue to live on the farm. The exercises are fully illustrated, classified, and arranged in logical sequence. The first group of exercises is intended to familiarize pupils with conditions of matter and changes in matter, and with the meaning of such terms as condensation, absorption, evaporation, assimilation, respiration, solutions, etc. The remaining exercises are arranged in groups relating to plants, soils and fertilizers, corn, wheat and oats, cotton, feeds and feeding, milk, fruits, home grounds, insects, and spraying. A glossary contains definitions of the principal scientific terms, and an appendix contains score cards and tables of values of fertilizers, feeds, weights, etc.

How agriculture can be taught in our schools, C. MANKENBERG (*School Ed., 27 (1908), No. 4, pp. 46, 48, 50*).—An account is given of the writer's experience in arousing an interest in agriculture without the use of the text-book.

Horticultural education, C. P. CLOSE (*Trans. Peninsula Hort. Soc. [Del.], 21 (1908), pp. 94–101*).—An address before the Peninsula Horticultural Society at Salisbury, Md., January 14–16, 1908, in which horticulture is defined and instruction in horticulture, as it is now carried on in different institutions, is discussed.

An elementary course in horticulture for the schools of Michigan, S. W. FLETCHER (*Mich. State Supt. Pub. Instr. Bul. 28, pp. 31, figs. 22*).—This bulletin was prepared at the request of the State superintendent of public instruction in Michigan as an elementary course in horticulture for the public schools. It deals with the propagation of plants, window gardening, fruit growing, landscape and flower gardening, and vegetable gardening, and is intended merely as an outline to be used in connection with a number of manuals to which numerous references are made.

The adornment of rural school surroundings, G. L. CLOTHIER (*Mississippi Sta. Bul. 109, pp. 3–12, figs. 4*).—As preliminary steps to the adornment of rural school grounds the author advises precautionary measures against live stock and trespassers, and enumerates the elements of environment of a country school that are capable of improvement. Directions are then given for handling nursery stock, arranging shrubs, lawns and walks, and planting vines and flowers. An outline plan of a model country school after the execution of the main features of the planting plan is included.

MISCELLANEOUS.

Annual Report of Alaska Stations, 1907 (*Alaska Stas. Rpt. 1907, pp. 98, pls. 7, figs. 3*).—This contains a report of the chief lines of work carried on during the year at the Sitka, Copper Center, Rampart, and Kenai stations with an account of the establishment of an additional station at Fairbanks and of a live stock breeding station at Kodiak Island, and brief notes on live stock operations on a ranch at Kodiak and on an attempt to interest the Indians in gardening, and reports from the seed distribution. Meteorological data, an article on Dairy Practice at Kenai Station, and accounts of extensive tests of field and garden crops are abstracted elsewhere in this issue.

Nineteenth Annual Report of Georgia Station, 1906 (*Georgia Sta. Rpt. 1906, pp. 242–252*).—This contains the organization list, a brief report by the

president of the board of directors, a report of the director on the work of the station during the year, and a financial statement for the fiscal year ended June 30, 1906.

Twentieth Annual Report of Georgia Station, 1907 (*Georgia Sta. Rpt. 1907, pp. 8*).—Data similar to the above are reported for the fiscal year ended June 30, 1907.

Annual Report of Hawaii Station, 1907 (*Hawaii Sta. Rpt. 1907, pp. 90, pls. 9, figs. 3*).—This consists of a general review of the work of the station during the year, and reports of the entomologist, horticulturist, assistant chemist, and expert in charge of rice investigations. Most of the experimental work is abstracted elsewhere in this issue. The report of the assistant chemist also contains analyses of 10 samples of Hawaiian soils and determinations of the salt content of the water from 3 wells to be used in irrigating the rice fields, and of the soils from 4 rice fields.

Twentieth Annual Report of Michigan Station, 1907 (*Michigan Sta. Rpt. 1907, pp. 95–392*).—This contains a financial statement for the fiscal year ended June 30, 1907, reports of the director and heads of departments on the work of the station during the year, meteorological observations noted elsewhere in this issue, and reprints of Bulletins 239–247 and of Special Bulletins 36 and 37 previously noted, together with reports of the South Haven Substation for 1906 and of the Upper Peninsula Substation for 1905 and 1906, noted on pages 133 and 143 of this issue.

Eighteenth Annual Report of New Mexico Station, 1907 (*New Mexico Sta. Rpt. 1907, pp. 56*).—This contains the organization list, a report of the director on the work and publications of the station, departmental reports on the various lines of station work conducted during the year, and a financial statement for the fiscal year ended June 30, 1907. The experimental work in horticulture is noted on page 144 of this issue. The report of the chemist contains analyses of 2 rubber-producing plants from Mexico, and of several samples of sugar beets, soils, and fertilizing materials.

Twentieth Annual Report of Rhode Island Station, 1907 (*Rhode Island Sta. Rpt. 1907, pp. 189–407+X*).—This contains the organization list, a report of the director reviewing briefly the work of the station during the year, departmental reports, the experimental work from which is abstracted for the most part elsewhere in this issue, a financial statement for the fiscal year ended June 30, 1907, a list of exchanges, and meteorological and other data.

Southern California Pathological Laboratory and Citrus Experiment Station, R. E. Smith (*California Sta. Circ. 35, pp. 11, figs. 4*).—This includes the law establishing the Southern California Pathological Laboratory at Whittier and the Citrus Experiment Station in Riverside, together with a description of their buildings and equipment, and an account of their present and proposed lines of work.

NOTES.

Colorado College.—A four-year course in forestry is being offered for the first time, as is also a course in practical and theoretical training in library science and library economy.

Connecticut State Station.—The station is issuing what are called postal-card bulletins, these being similar in form and size to ordinary postal cards. They are not numbered or distributed with the regular bulletin series but consist of brief notes of a popular nature, one recently issued discussing cankerworm.

Harry R. Stevens has resigned as chemist, and has been succeeded by Clarence W. Rodman.

Georgia College and Station.—R. J. H. DeLoach has resigned as botanist in the station to accept the professorship of cotton industry in the college, his resignation becoming effective November 1. A portion of his time is expected to be available for cotton investigations.

Illinois University.—President E. J. James has returned from a tour of inspection of the leading veterinary colleges of Europe, undertaken with special reference to the new State veterinary college to be established in Chicago as a department of the university.

Purdue University.—A course in normal training, in charge of George L. Roberts, has been added to the general curriculum, and is expected to be of special interest to agricultural students.

Kansas College and Station.—Mrs. Mary P. Van Zile has been elected professor of domestic science and dean of women. J. E. Smith has been appointed assistant in botany in the college, O. A. Stevens, assistant botanist in the station, J. C. Cunningham assistant horticulturist, and J. B. Parker assistant entomologist in the college and station.

Louisiana Stations.—Dr. P. A. Yoder, a former chemist and director of the Utah Station, has been appointed research chemist in the Sugar Station, vice Dr. Fritz Zerban, whose resignation has been previously noted.

Maine University and Station.—Recent appointments include F. L. Russell as professor of bacteriology and veterinary science in the university and assistant biologist in the station, V. R. Gardner as assistant professor of horticulture, and W. A. Brown as assistant professor of poultry husbandry.

The station has recently erected, adjacent to and connected with the main building, a small greenhouse for the use of the entomologist and plant pathologists.

Maryland Station.—Nicholas Schmitz, of the Forage Crop Investigations of this Department, has been appointed agronomist, and will enter upon his duties January 1, 1909. The State Live Stock Sanitary Board is to cooperate with the station in a test of the new hog-cholera serum of this Department, and will undertake its distribution if favorable results are obtained.

Missouri Station.—Francis Ward Woodman has been appointed research assistant chemist, and Charles Kenworthy Francis research assistant in agricultural chemistry.

Nebraska Station.—Assistants recently added to the staff include Robert S. Trumbull, agricultural chemistry, Miss Venus W. Pool and W. H. Hein, agricultural botany, Percy B. Barker, soils, and Myron H. Swenk, entomology.

Oklahoma College.—A grant of $62,000 for a domestic science building and girls' dormitory and of $25,000 for a boys' dormitory was made by the last legislature.

Rhode Island College.—Plans have been accepted for the construction of the men's new dormitory and dining hall, for which $55,000 was appropriated by the last general assembly. The number of agricultural students has increased very rapidly in recent years, and the total enrollment is such as to tax the accommodations of the college and village to the utmost.

Vermont Station.—Harry L. Miner, a 1907 graduate of the University of Maine, has been appointed assistant chemist beginning November 1.

Experiment Stations in Portuguese East Africa.—A letter recently received from Mr. O. W. Barrett, director of agricultural experiment stations in Portuguese East Africa, gives additional details regarding the status of these institutions. Grants have been voted by the legislative council of $30,000 for the purchase of agricultural implements, including a steam plow, $13,000 for fencing, $6,700 for live stock, and $6,000 for laboratory equipment.

It is planned to establish a central station and two or three substations, embodying a total area of probably more than 3,000 acres, the substations to be located at Chai-Chai on the Limpopo River, at Inhambane south of and at Quelimane north of the Zambezi River. Plans for the office and laboratories of the central station at Lourenço Marques have been approved and the work of construction has been begun.

Entomology and veterinary sections have been established in charge, respectively, of C. W. Howard and P. Conacher, both of whom were formerly connected with the Transvaal Department of Agriculture. A reconnaissance of the territory and also of the province of Zambezia is expected to be undertaken as soon as possible.

Agricultural Legislation in Mississippi.—At the last session of the Mississippi legislature a number of acts were passed with a view to promoting the agricultural interests of the State. Among these was an act authorizing each county in the State to build an agricultural high school and pledging a State support fund of $1,000 annually for each school meeting certain specified conditions. Fifteen counties have already located schools. The first of these was Noxubee County, which has voted a tax levy of 1 mill upon the taxable property of the county for the support of its county agricultural high school at Mashulaville, an inland village 12 miles west of Macon. This school will have an income of $1,000 from the State, $1,000 from the public schools merged into it, and $5,000 from the county, making an annual income of $7,000.

The legislature also authorized boards of supervisors to appropriate money for premiums to boys engaged in corn-growing contests. Such contests were organized in 5 counties last year and in 23 counties this year, with over 3,000 boys engaged in the work. There are also about 500 girls organized in home culture clubs. Exhibits are first held in the home counties, after which those taking prizes are shown at the State fair.

Other measures passed by the legislature provided for a live stock sanitary board, which is engaged particularly in cooperating with this Department in ridding the State of the cattle tick, for the appointment of county commissioners of agriculture for the protection and fostering of horticulture and fruit growing, and for the regulation of the sale and providing for the inspection of commercial feeding stuffs.

New Agricultural School for Negroes.—An agricultural and industrial school for negroes has been established at Sandy Spring, Montgomery County, Md. The purpose of the institution is to give instruction in agriculture, mechanics, and household arts, and to prepare teachers to teach agriculture in the rural schools. George H. C. Williams, instructor in biology at Armstrong Manual Training School, Washington, D. C., has been selected for the principalship.

New Buildings at Crookston School of Agriculture.—Stephens Hall, the three-story dormitory recently erected at a cost of about $43,000, was dedicated September 17. The speakers included Hon. J. J. Hill, who was the orator of the day, Congressman C. R. Davis, Prof. William Robertson, of the school, P. M. Ringdahl, president of the board of control, State superintendent of public instruction John Olson, and Director Randall, of the Minnesota University and Station. An industrial building, costing about $15,000, and containing a lecture room, creamery, and blacksmith and carpenter shops, is nearing completion.

Country Teachers' Association of Illinois.—This association was organized at a meeting held at Macomb, Ill., July 22 and 23. Its purpose is indicated in resolutions adopted pledging the efforts of its members to increase the usefulness of the country school by improving its physical and social environment, and the enrichment of its course of study in such manner as will bring the child into sympathetic and vital relationship with his environment, by country school extension work through the different educational institutions, offices, and agricultural associations, by consolidating weak country schools, by encouraging more thorough preparation, larger salaries, and longer tenure of positions for teachers, and by the further development in State normal schools of facilities for training country school-teachers.

The Colorado State Fair and Agricultural Education.—The Colorado State fair authorities entered upon a new departure in education this year in the way of offering scholarships as prizes for young people's contests. A scholarship of $125 in any of the regular courses at the State Agricultural College was offered to the boy under 21 years of age who did the best work in judging live stock and corn, and a scholarship of $100 in any college or university in Colorado to the girl doing the best work in the preparation of certain foods and in giving the reasons for the methods employed.

Forestry Work in Massachusetts.—Under a recent act of the State legislature the expenditure of $5,000 in 1908 and $10,000 annually thereafter is authorized for the purchase of lands adapted to forest production. The act permits the repurchase of these lands by the original owners, under certain restrictions, and at any time within 10 years, at the purchase price plus interest at 4 per cent and the amounts expended in improvements and maintenance.

The control and management of these State lands are vested in the State forester, who is also authorized to accept donations of land for the purpose and also to expend not exceeding 20 per cent of the appropriation for the distribution of seeds and seedlings to landowners at not less than cost. It is expected that considerable land will be acquired under this act, especially small tracts held for the control of municipal water supplies, and that these will give opportunity for demonstrations in forest planting and management.

International Congress on Tuberculosis.—The 1908 session of this Congress, held in the new building of the National Museum, Washington, D. C., from September 21 to October 12, was an event of extreme interest and importance from both the scientific and popular standpoint. The speakers included the President of the United States, Secretary Wilson of this Department and others, members of the Cabinet, and a large number of scientific investigators, representatives of the medical and veterinary professions, health officials, and others

prominently identified with various phases of the campaign against the disease. Accredited delegates were in attendance from every civilized country except Japan, and in addition there were hundreds of visitors at the general sessions and the exhibition.

The congress as a whole dealt especially with human tuberculosis, but considerable attention was directed to tuberculosis in domestic animals, and notably to questions dealing with the milk and meat supply and with the inspection of these products. One of the seven sections into which the congress was divided devoted itself especially to these topics, and the general addresses before the congress as a whole included a lecture by Prof. Bernard Bang, of Copenhagen, Denmark, on Studies in Tuberculosis in Domestic Animals and What We May Learn Regarding Human Tuberculosis. An extended discussion followed the reaffirmation by Prof. Dr. Robert Koch, of Berlin, of his theory as to the nonidentity and nontransmissibility of human and bovine tuberculosis, after which a resolution was unanimously adopted recommending "that preventive measures be continued against bovine tuberculosis and that the possibility of the propagation of this to man be recognized."

The very extensive exhibits from the various countries in America and Europe attracted much attention, and presented a vast amount of illustrative material of rare educational value. Phases dealing especially with the prevention and treatment of the disease in its early stages predominated, there being a great variety of models of sanitoria and special appliances, but there were also shown a large number of devices designed to afford better housing, sanitation, and food supply, many of which were of general application to everyday life. A model dairy was operated daily, bacterial counts of about 800 per cubic centimeter being repeatedly obtained under conditions believed to be within easy access of the average producer. The Maryland College and Station exhibited a model of a barn and feeding shed, and the Minnesota Station presented charts and other material pertaining especially to the dissemination of the disease. A collection of pathological material was shown by the Bureau of Animal Industry of this Department, and the University of Wisconsin presented an elaborate exhibit dealing especially with human tuberculosis.

At the close of the congress a tour was made by many of the delegates to the chief cities of the country for the purpose of inspecting the various hygienic methods employed by boards of health, charitable institutions, and hospitals of the various communities. Press reports announce that the exhibition is to be transferred to New York City for an extended period.

The next session of the congress is to be held in Rome in 1911.

Philadelphia Meeting of the American Veterinary Medical Association.—The forty-fifth annual meeting of this association was held at the University of Pennsylvania, September 7–11. A large number of papers were presented on tuberculosis, glanders, Texas fever, cattle and sheep scabies, hog cholera, milk inspection, veterinary education, and other topics. The final day was, as usual, devoted to a surgical clinic, held at the veterinary school of the university, at which a special feature was a lecture and demonstration by Dr. Leonard Pearson on epizootic lymphangitis, a disease hitherto almost unknown in this country.

The officers chosen included J. G. Rutherford, of Ottawa, veterinary director general of the Dominion of Canada, as president; R. P. Lyman, of Hartford, Conn., as secretary; and George R. White, of Nashville, Tenn., as treasurer.

A meeting of the Association of Veterinary Faculties and Examining Boards of North America, an affiliated organization, was also held in Philadelphia September 7, at which after extended discussion a resolution was adopted

endorsing the action of this Department in the appointment of a committee to inquire into the present status of veterinary education in this country.

American Home Economics Association Proposed.—The initial number of a trial series of quarterly bulletins being issued by the Lake Placid Conference on Home Economics announces the appointment at the July meeting of the conference of a committee, of which Dr. C. F. Langworthy of this Office is chairman, to formulate a plan of organization for a national association of those engaged in the solution of home and home economics problems. This committee is to report to the teaching section of the conference at a meeting to be held in Washington, D. C., during the Christmas recess, at which time the question of a national organization will be discussed.

New Journals.—*Zeitschrift für den Ausbau der Entwicklungslehre*, a monthly devoted to the critical discussion of problems in zoology, botany, physiology, psychology, paleontology, biochemistry, and philosophy in their relations to evolution, is being issued at Stuttgart, with R. H. Francé as editor.

Trudni Byuro po Prīkladnoĭ Botanīkye is being issued at St. Petersburg by the Bureau of Applied Botany as a bimonthly. The initial number contains articles in both the Russian and German languages, including papers on Smooth-Awned Barley and Directions for Uniform Sowing of Different Kinds of Grain for Comparative Botanical Investigations.

O Fazendeiro, a monthly review of agriculture, industry, and commerce with special reference to coffee growing, has been established at São Paulo, Brazil. A recent number contains a brief account of a proposed reorganization in the Louis Queiros School of Agriculture, of which C. D. Smith, formerly of the Michigan College and Station, is now director.

Annals of the Entomological Society of America is being published quarterly by the society, with Herbert Osborn as managing editor. An announcement in the initial number states that "the scope of the Annals will be as broad as the interests of the society which it represents, but it may not be out of place to emphasize the point that papers dealing with morphologic, faunistic, and biologic problems, as well as toxonomy in its broadest sense, will be especially welcome." In addition to data as to the constitution, membership, and proceedings of the society, the initial number also contains Notes on Chalcid Infesting Apple Seed, Polymorphism of Ants, and The Habits of Insects as a Factor in Classification.

Miscellaneous.—F. H. A. Marshall has been appointed to the recently established university lectureship in agricultural physiology in Cambridge University.

The retirement of J. H. Hart, superintendent of the Botanical Department of Trinidad, is announced after 34 years' service in the Tropics.

Dr. Francis Huntington Snow, formerly chancellor of the University of Kansas and well known as an entomologist, died at Bellefield, Wis., September 20.

Hermann Settegast died in Berlin August 11 at the age of 90. Among his extensive agricultural writings were Tierzucht (1868, fifth edition 1888), Die Landwirtschaft und ihr Betrieb (1875, third edition 1884), Die deutsche Landwirtschaft vom kulturhistorischen Standpunkt (1884), Der Idealismus and die deutsche Landwirtschaft (1885), and Die deutsche Viehzucht, ihr Werden, Wachsen und gegenwärtiger Standpunkt (1890).

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EXPERIMENT STATION RECORD.

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Assistant Editor: H. L. KNIGHT.

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Rural Engineering—
Rural Economics—J. B. MORMAN.
Agricultural Education—D. J. CROSBY.

CONTENTS OF VOL. XX, NO. 3.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Continued.

U. S. Department of Agriculture.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XX. NOVEMBER, 1908. No. 3.

A report of considerable importance concerning agricultural education in England and Wales has recently been submitted by a special committee appointed by the president of the Board of Agriculture and Fisheries. The report comprises a brief history of agricultural education in England and Wales up to the present time, a more extended view of the progress and development of agricultural education from 1888 to 1908, a description of existing facilities for agricultural education, and recommendations concerning its further development. The inquiry of the committee did not extend to rural secondary and elementary schools since these are under the control of the Board of Education and are not within the province of the Board of Agriculture and Fisheries.

It seems that in England and Wales there are two main sources of financial support for technical and agricultural education. The first includes funds derived from the Excise Act of 1890, which are turned over to local boards known as County Councils to be used for the encouragement of agricultural education, experiments, and demonstrations. These funds are largely used in the counties from which they are derived or are devoted to the support of educational centers which serve two or more counties. These centers may be universities, agricultural colleges, or special institutions deriving their main support from these funds, or they may be special institutions established and maintained by the County Councils. The second source includes funds controlled by the Board of Agriculture and Fisheries which are used for the encouragement of agricultural education by making grants to a selected list of institutions giving instruction in agriculture. In several instances the institutions aided by the Board of Agriculture and Fisheries also derive a part of their support from County Councils.

The committee in its investigations made a study of the work of six universities and university colleges, five agricultural colleges, two dairy institutes, one fruit and cider institute, one veterinary college,

and four agricultural or farm institutes, all of which receive grants from the Board. The committee also sought information from every County Council concerning its provisions for technical and practical instruction in agriculture, from nine colleges and institutions which give instruction in agriculture but are not aided by the Board, from two technical colleges for women, and from many agricultural societies, landowners, farmers, farm managers and others who might have opinions of value concerning the subject of their inquiry. In this way a large mass of information was collected which has been published in Part II of the committee's report, Part I being devoted to its findings and recommendations. The committee also made a considerable study of facilities and methods in teaching agriculture in other countries with a view of recommending such features of instruction as would be applicable to conditions in England and Wales.

In general the committee found that satisfactory progress had been made in practical and scientific instruction in agriculture during the past 20 years, and that farmers now take a keen interest in the work of agricultural institutions. It believes that the establishment of a few more higher agricultural institutions, some of which are now projected, would furnish the country with a sufficient number of collegiate centers, but it found that "the facilities for agricultural instruction of a lower grade are unorganized, unsystematic, and wholly inadequate."

The committee is evidently convinced of the importance of providing a thoroughly equipped staff of specialists for the higher institutions, and well-trained teachers for those of lower grade. With reference to the development of existing facilities the report states that "attention should be given to securing a highly qualified staff. Many institutions employ too few teachers or relegate the teaching of important subjects to junior members of the staff. It is of special importance that higher qualifications should be secured in the teachers of such subjects as agriculture, agricultural chemistry, and agricultural botany. . . . Further developments in agricultural education will be difficult until a greater supply of well-qualified teachers is available." The committee also recommends the employment of itinerant instructors in agriculture, horticulture, farm hygiene, dairying, poultry keeping, and other subjects in every county, and emphasizes the fact that these instructors should be selected from those who have had practical experience. They should have their headquarters at a centrally located agricultural institution, so that arrangements for systematic demonstrations or improved practice can be made. And finally, as regards the teaching force, it recommends "that universities and colleges in receipt of aid from the Board of Agriculture should provide courses of instruction on subjects bearing on agriculture and horticulture for elementary school teachers."

Lack of attention to post-graduate work in agriculture in England and Wales was alluded to by the committee in its recommendation that "the Board of Agriculture provide or encourage the provision of scholarships for post-graduate research, and also traveling fellowships for teachers, enabling them to study foreign systems of agriculture." It also believes that there should be increased provision for original research, field experiments, fruit stations, and demonstration plats, and recommends that the Board of Agriculture collate the results of experiments and publish those directly bearing on the improvement of agricultural practice.

As regards instruction in agriculture of a lower grade, which the committee believes to be of vital importance, the winter agricultural school "appears to be especially adapted to the needs of this country." It is believed that within the next 10 years from 50 to 60 of these schools will be provided and that their course of study should be especially adapted to boys from 17 to 20 years old who have already had some practical instruction in agriculture or horticulture. Short winter courses in colleges have been held with success and should be continued, and this is true also of local winter courses "which should be encouraged until longer and more systematic courses of instruction are available at winter agricultural schools."

The committee calls attention to satisfactory instruction now being given in a number of special subjects, such as forestry, dairying, and veterinary science, and recommends that greater attention be given to such instruction in future.

With regard to the organization of agricultural instruction the committee believes that "agricultural instruction, when provided by universities, university colleges, agricultural colleges, farm institutes and winter schools, or by means of special classes or courses of lectures in agriculture and kindred subjects (e. g., dairying, horticulture), should be under the direction of the Board of Agriculture; while all instruction in agricultural subjects forming part of courses in primary, secondary, or such evening schools as are in definite continuation of the education given in primary schools, should be under the Board of Education."

Credit is given to national agricultural societies for good educational work, but it is stated that local societies have given little aid to either agricultural education or research. Greatly increased funds are needed for agricultural education and these apparently must come mainly from national sources. The committee believes that the Board of Agriculture should first aid existing and projected institutions to strengthen their staff and improve their general equipment and then assist local authorities to make provision for the agricultural work conducted by them.

All members of the committee subscribed to the conclusions and recommendations in this report, but one member, J. C. Medd, believes that certain points of vital importance to the effective organization of a national system of agricultural education have been omitted. One serious defect in the English system which he considers important is the lack of intermediate schools of agriculture corresponding to écoles pratiques d'agriculture de France and to some of the agricultural high schools in this country. He believes that no system of instruction is complete which does not provide for the continuous instruction of boys from the age of 14 to 18. Winter schools will not entirely fill this gap and it can only be filled by the establishment of a few intermediate schools with courses extending over two or three years. He calls attention to the fact that the expense of equipping and conducting such schools is too great for their universal establishment, but believes that they should be established where conditions are favorable and where there is likely to be a demand for them.

Mr. Medd further strongly recommends the holding of conferences of representatives from affiliated or associated counties at their respective university or college centers for the purpose of coordinating and strengthening their work. With reference to the literature published by the Board of Agriculture and Fisheries, he points out that many of the witnesses were unfamiliar with particular reports or leaflets and recommends that all literature issued by the board be distributed, free of cost, to all agricultural and horticultural colleges and schools, farm institutes, chambers of agriculture, farmers' clubs and agricultural or horticultural societies.

The report as a whole indicates that the committee has made an exhaustive and careful study of all the facilities available in England and Wales for promoting technical instruction for its youth along agricultural lines, with the single exception of the public elementary schools in rural districts which are under the administration of the Board of Education. These latter schools are alluded to in Mr. Medd's supplementary statement in a paragraph calling attention to the provisions made by the Board of Education to train teachers along agricultural lines for them. The conclusions of the committee show that there is a strong growth of public sentiment in Great Britain in favor of a complete national system of agricultural education to take the place of the widely varied types of colleges and schools which now afford instruction along agricultural lines. As an indication of the growth of such sentiment it is reported by the committee that agriculture now receives recognition in all the universities in that country and that the Royal Agricultural College at Cirencester, and other agricultural institutions which have hitherto

been operated under private control, are considering the advisability of taking, or have already taken, steps to become public institutions.

The Lake Placid Conference of Home Economics was organized in 1899 for the consideration and study of a variety of problems relating to the home, and particularly for the development of the educational side of the subject. Since its organization the conference has held annual meetings at which papers have been presented, topics have been discussed and plans have been formulated for furthering work in home economics. The conference meetings have been of great benefit to teachers in American agricultural colleges and other educational institutions and have done much to raise the standard of education and efficiency in home economics. It is now generally recognized that the subject can be so taught that it does not simply mean the training of women so that they may be good cooks and housewives. It may be presented in such a way that it is in reality "mentally nutritive," and by properly correlating the different sciences and other subjects around the central idea of the home a course can be provided for women which is logically consistent and high in its ideals. At the same time it may be so related to women's activities that when thus trained they may be efficient workers in their homes and communities, while they will also have a truly liberal education.

Though of wide influence, the Lake Placid Conference has never been a large organization, and the opinion has been generally expressed that the growth of the home economics movement has been so great that a new organization is now needed which will be wide in its scope and unite the many interests which have to do with this subject. With this idea in mind the first steps were taken at the Chautauqua meeting of the Lake Placid Conference last July toward the founding of a body for which the name "American Association of Home Economics" has been proposed. This organization, it is believed, will be to the home economics movement in the United States and Canada what the American Chemical Society, the American Forestry Association, the American Physiological Society, and similar organizations are in their respective fields.

A meeting of the new association will be held in Washington December 31 to January 2 for purposes of organization and for outlining the work. The association will seek to bring together teachers in home economics and related subjects, superintendents of schools and other educators, parents, physicians, investigators, health officers, architects, settlement workers, and students of social and civil affairs, and others who are interested in the study of some phase of the general question. Each of these groups has some valuable contribution to make and some suggestion to offer with reference to the means by which formal and informal educational enterprises may be pro-

moted, for although the home economics movement reaches out in many practical ways into home and community life, it is after all an educational movement. The agricultural experiment stations, the agricultural colleges, and the Department of Agriculture have perhaps contributed more than any other group of educators and investigators to the fund of information on which the subject of home economics is based, and it naturally follows that those who are interested in agricultural education and investigation are interested in home economics as well.

The subject of home economics is already an important one in American agricultural colleges. Some twenty-five of these colleges and similar institutions receiving government aid are now offering courses in this line, and others contemplate the introduction of the work. Their active interest in home economics is also shown by the attempts which are being made to classify and arrange available material related to home economics for educational purposes in the same way that agricultural data have been reduced to pedagogical form.

The experiment stations have already made important contributions to home economics literature and should be interested in the new organization because it should prove a stimulus to further research. Such an organization which aims to bring together investigators, teachers, students, and others whose interests are in considerable part the same should be able to do a great deal for the advancement of home economics throughout the country.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

On the quantitative volatilization of phosphoric acid from phosphates in a current of chlorin and carbon tetrachlorid or of tetrachlorid alone, P. JANNASCH and W. JILKE (*Ber. Deut. Chem. Gesell., 40 (1907), No. 13, pp. 3605–3608, fig. 1; Jour. Prakt. Chem., n. ser., 78 (1908), No. 1, pp. 21–28; abs. in Ztschr. Analyt. Chem., 47 (1908), No. 2–3, p. 162; Chem. Zentbl., 1908, II, No. 4, pp. 348, 349; Chem. Ztg., 32 (1908), No. 65, Repert., p. 417*).—This is an account of a continuation of the work by Jannasch and Heimann (E. S. R., 18, p. 522), who found that phosphoric acid could be quantitatively volatilized by heating with sugar and concentrated sulphuric acid in a stream of chlorin. The later investigations show that the same result can be more easily obtained with all kinds of phosphates by heating in a current of chlorin charged with carbon tetrachlorid or of tetrachlorid alone. The apparatus required in the process is described.

A study of the solubility of potassium chloroplatinate, E. H. ARCHIBALD, W. G. WILCOX, and B. G. BUCKLEY (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 747–760, figs. 3*).—Studies of the solubility of potassium chloroplatinate in water, potassium and sodium chlorid solutions, and different alcohols are reported. It was found in these studies that:

"(1) Small amounts of potassium chloroplatinate in solution can be estimated colorimetrically with considerable accuracy. This will be true of any salt which gives the $PtCl_6$ anion, provided the color of the cathion is not such as to interfere.

"(2) The chloroplatinate is less soluble in solutions of ethyl alcohol and water than in water solutions of either methyl or isobutyl alcohol. Only 0.0007 gm. of the salt dissolves in 100 cc. of ethyl alcohol at 20°.

"(3) The solubility of the chloroplatinate in potassium chlorid solutions decreases with the increase in concentration of the potassium chlorid until a concentration of 1 gm. molecule per liter is reached. Beyond this point, increasing the concentration of the potassium chlorid has practically no effect.

"(4) The solubility of the chloroplatinate in solutions of sodium chlorid increases rapidly until a concentration of 0.05 gm. molecules per liter is reached. For more concentrated solutions the increase in solubility is small and almost proportional to the increase in concentration of the sodium chlorid."

The destruction of organic matter by electricity in the analysis of foods and agricultural products, F. SCURTI and O. GASPARINA (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 1 (1906–7), pp. 150–155*).—The use of electricity for the destruction of organic matter is, according to the authors, simple and gives satisfactory results.

The volumetric determination of hardness in potable waters, U. MILONE (*Atti 6. Cong. Internaz. Chim. Appl., 1 (1906), pp. 258–260*).—A new degree of hardness, viz, centigram of calcium per liter of water, is proposed, and the

strength of the soap solution is modified accordingly. The method is claimed to be more accurate than others because a dilute solution of soap and a burette graduated to tenths of a centimeter are used, quicker because no calculation is necessary, and more modern because hardness is stated in terms of calcium and not carbonate or oxid of calcium.

Studies on direct Nesslerization of Kjeldahl digestates in sewage analysis, G. O. Adams and A. W. Kimball (*Jour. Amer. Chem. Soc., 30 (1908), No. 6, pp. 1034–1037*).—A series of tests made to determine the merits of the claims made for this method is reported. The conclusions reached are as follows:

"The direct Kjeldahl method undoubtedly has its own place in sewage work, but it does not seem as if it should take the place of the distillation method in a permanent sewage laboratory handling many samples because of—

"(1) The greater amount of bothersome and bulky apparatus necessary; (2) the large amount of nitrogen-free water required; (3) the greater chance for error in manipulation; (4) the necessity of having the excess of caustic within narrow limits to avoid turbidity, this practically requiring a rough titration of each determination; (5) the greater length of time required for the determination.

"The method, however, is without doubt an excellent substitute for the distillation method in a temporary laboratory where it is necessary to incur the least possible expense for apparatus or in a small laboratory where but a very few determinations are to be made daily."

On the determination of nitrogen in gas mixtures, A. P. Lidoff (*Atti 6. Cong. Internaz. Chim. Appl., 1 (1906), pp. 35–38, fig. 1*).—The apparatus and method used for this purpose are briefly described.

Determinations of nitric acid in arable soils, M. Weibull (*Svensk Kem. Tidskr., 20 (1908), Nos. 1, pp. 11–13; 2, pp. 22–26*).—A description and discussion of the phenoldisulphonic-acid colorimetric method of determining nitric acid in soils. The method adopted by the author was that of Grandval and Lajoux for determining small amounts of nitric acid in water,[a] modified for use in soil analysis by O. Reitmair.

Note on the Dyer method for the determination of plant food in soils, F. T. Shutt and A. T. Charron (*Jour. Amer. Chem. Soc., 30 (1908), No. 6, pp. 1020–1023*).—In tests of modifications of Dyer's method on a prairie soil well supplied with potash and nitrogen and containing fair amounts of phosphoric acid and lime it was found that "reducing the period of digestion from 7 days to 5 hours materially decreased the amount of phosphoric acid dissolved, but did not similarly affect the potash—the percentages of the latter being practically identical for both periods. The lime falls off but slightly with the shorter digestion. . . . Reducing the volume of solvent used, materially decreases the percentages of phosphoric acid and potash obtained. In the case of lime, the smaller volume extracted but one-half that taken out by the larger volume. Clearly, the influence of volume of solvent is decidedly greater than that of the period of extraction."

A new method for the quantitative determination of diastatic ferments, J. Wohlgemuth (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 1–9, pl. 1*).—A colorimetric method is described.

The probable chemical constitution of rennet, A. Scala (*Staz. Sper. Agr. Ital., 40 (1907), No. 2, pp. 129–149*).—In the author's opinion rennin is a weak base which consists of an albumose nucleus and amino-side-chains. Upon heating its activity is destroyed and its composition altered. A similar result is

[a] Compt. Rend. Acad. Sci. [Paris], 101 (1885), p. 62; see also U. S. Dept. Agr., Bur. Soils Bul. 22, p. 67.

effected by formaldehyde, the amid-hydrogen being replaced by the methylene group.

Pepsin and rennet, I. Bang (*Ztschr. Physiol. Chem., 54 (1908), No. 4, pp. 359–362*).—The author believes that these two substances are not identical.

Methods of determining the moisture content of butter, G. L. McKay and J. Bower (*Iowa Sta. Bul. 97, pp. 4–39, figs. 8, dgm. 1*).—A description is given of several methods of determining the moisture content of butter, including the official, Gray, Richmond, Patrick, and Irish methods, the Wisconsin high-pressure oven, the Caroll and Geldard testers, the Wagner butter hygrometer, and a new method devised by the station and termed the Ames method. The various methods are discussed with special reference to their use in creameries, their simplicity, the cost of apparatus and of manipulation, and the intelligence of operators being taken into account. Results obtained in tests of several of the methods are reported and compared with those from the official method.

In the Ames method, which is designed to overcome inaccuracies involved in the use of the aluminum beaker methods, due to lack of control of heating temperatures, a 10 gm. sample is weighed into a tared aluminum beaker or other suitable vessel which is then inserted in a vessel containing paraffin at from 150 to 200° C. until foaming ceases, shaking occasionally. The best results are obtained at a temperature approaching 175°. After heating, the beaker is carefully wiped to remove any paraffin that may have adhered, cooled, and reweighed. If preferred, the beaker may be inserted in a slightly larger beaker during the heating, thereby eliminating any error through the adhesion of paraffin. Of 50 analyses by this method 6 only varied 0.2 per cent from the official method, and 1 only was in excess of 0.3 per cent difference.

Directions for the selection and care of scales, sampling butter and preparing the sample, with analyses showing the variation in water content of butter from different parts of the churn, different tubs from the same churning and different parts of the same tub, are given.

German and American lard, E. Seitter (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, pp. 485, 486*).—Characteristic differences in German and American lard are discussed with a view to their differentiation in food analysis.

Crystallization experiments with lard and tallow, E. Seitter (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, p. 486*).—According to the author, the addition of tallow to lard may be detected by characteristic differences in lard and tallow crystals. In the method described a gram of the fat was dissolved in 15 cc. of chloroform, 30 cc. of absolute alcohol was then added, and the mixture allowed to stand over night in a stoppered flask at medium temperature. The crystals formed were removed by filtration, washed with absolute alcohol, and studied microscopically.

Concerning that portion of meat extract which can not be salted out, K. Micko (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, pp. 449–462*).—In the portion of meat extract which can not be salted out the author identified monamino and diamino acids, the present report being taken up with the first-mentioned group. This included glycocoll, alanin, leucin, aspartic acid, and glutaminic acid, as well as taurin. He believes that alanin, glutaminic acid, and taurin are original constituents of the meat extract.

Extract of meat, C. M. W. Grieb (*Pharm. Jour. [London], 4. ser., 26 (1908), No. 1971, pp. 441, 442*).—A note on analytical methods followed in the examination of meat extract for the detection of yeast extract.

Methods for the analysis of vegetable foods, J. Alquier (*Ann. Sci. Agron., 3. ser., 2 (1907), I, pp. 47–103*).—A summary and discussion of methods used for determining the composition of vegetable foods.

A comparison of methods of estimating sugar which depend upon the reducing power of dextrose, T. Kinoshita (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 208–230, fig. 1*).—A study of methods.

The keeping power of Fehling's solution, and the volumetric process of determining reducing sugars with it, F. Watts and H. A. Tempany (*Jour. Soc. Chem. Indus., 27 (1908), No. 5, pp. 191–193*).—A study of methods with special reference to the analysis of muscovado sugar.

Identification of δ-fructose in the presence of other natural sugar, J. Pieraerts (*Bul. Assoc. Chim. Sucr. et Distill., 25 (1908), No. 9, pp. 830–848*).—According to the author's investigations, by the use of alkaline cupric salt solutions in the manner prescribed it is possible to determine whether or not δ-fructose is present.

The detection of artificial and natural honey, J. Fiehe (*Eine Reaktion zur Erkennung und Unterscheidung von Kunsthonigen und Naturhonigen. 1908, Mar.; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, pp. 492, 493*).—The author's method for the detection of artificial honey depends upon the fact that invert sugar gives a characteristic color reaction with resorcin and concentrated hydrochloric acid.

The analysis of waste molasses, H. Johnson (*Hawaii. Planters' Mo., 27 (1908), No. 1, pp. 22–27*).—The apparent purity of molasses was found to range from 33.2 to 36.6 and the true purity from 43.1 to 45.2. "In other words, one is able to obtain nearly any desired purity simply by choice of the clarifying reagent and the amount used in analysis. Evidently, therefore, in order that the results of the analysis of molasses have even a comparative value, it is necessary that all determinations be conducted under exactly the same conditions. The dilution of the molasses should be the same, the same clarifying reagent should be used, and as far as possible the quantity of reagent used should be the same. For control work, the true value of the molasses should be determined by Clerget's method of double polarization, and the total solids by drying."

Analysis of flour (*Rev. Gén. Agron., n. ser., 3 (1908), No. 2, pp. 82–84*).—A summary of data regarding French official methods of analysis.

The decomposition of lecithin-phosphoric acid when alimentary pastes are stored, H. Matthes and O. Hübner (*Chem. Ztg., 32 (1908), No. 16, p. 186*).—The work of other investigators is summarized and some determinations are reported. The authors conclude that since the breaking down of the lecithin-phosphoric acid is apparently influenced by conditions which can not be controlled, data dependent upon the determination of this constituent should be used with caution in judging of the number of eggs which have been used in the preparation of such foods.

Changes in the extractives in the determination of wine extract, T. Roettgen (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 257–262*).—On the basis of analytical data the author discusses the determinations of wine extractives with reference to the German pure food law.

The identification of blueberry juice in fully fermented red wine, W. Plahl (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 262–269*).—The author recommends making the wine slightly alkaline and evaporating to half its volume before lead acetate is added to precipitate the coloring matter.

Determining extract in vinegar, K. Windisch and P. Schmidt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 269–272*).—A study of methods.

Detection of boric acid in foods, C. Mannich and H. Priess (*Chem. Ztg., 32 (1908), No. 25, pp. 314, 315, fig. 1*).—An improved method of using the flame test for the detection of boric acid is described.

Further observations on the inhibiting effect of fluorids on the action of lipase, together with a method for the detection of fluorids in food products, S. Amberg and A. S. Loevenhart (*Jour. Biol. Chem., 4 (1908), No. 2–3, pp. 149–164*).—Fluorids, it was found, powerfully inhibit the action of lipase and, according to the authors, this property "furnishes an interesting biochemical test for the presence of fluorids in food products and will doubtless prove of considerable value in the work of food inspection."

The quantitative estimation of benzoic acid in catsup, C. H. LaWall and H. A. Bradshaw (*Amer. Jour. Pharm., 80 (1908), No. 4, pp. 171, 172*).—The principle on which the method is based is the use of sodium chlorid and hydrochloric acid to prevent emulsification. The benzoic acid is separated by extraction with chloroform.

The use of the microscope in the detection of food adulteration, B. J. Howard (*U. S. Dept. Agr. Yearbook 1907, pp. 379–384, pls. 4*).—As the author points out, the microscope may be used as an important aid in the detection of food adulteration. Its use in the analysis of starch products, spices, coffee and chocolate preparations, jellies and jams, cream, edible fats and honeys, is discussed, the text being supplemented by reproductions of micro-photographs.

"Though only a few of the more obvious forms of adulteration have been discussed, for the field has as yet been only partly explored, they may serve to illustrate how the microscope comes to the aid of the chemist when he endeavors to detect fraud in foods and food products."

Determining aldehydes with the spectroscope, P. Bruylants (*Acad. Roy. Belg., Bul. Cl. Sci., 1907, No. 11, pp. 955–977*).—The principal subject taken up is the determination of citral in lemon extract.

On a modification of the Schultze-Tiemann apparatus, M. Jacqué (*Atti 6. Cong. Internaz. Chim. Appl., 1 (1906), pp. 264–266, fig. 1*).—A conveniently mounted apparatus somewhat larger than usual is described.

On the general application of the Christomanos carbon dioxid apparatus, A. C. Christomanos (*Atti 6. Cong. Internaz. Chim. Appl., 1 (1906), pp. 56, 57*).—The use of this apparatus for the determination of urea is briefly explained.

Report of the chemical division, R. E. Rose (*Fla. Quart. Bul. Dept. Agr., 18 (1908), No. 1, pp. 152*).—This report includes the result of inspection of fertilizers, feeding stuffs, foods, and drugs during the year 1907, with the laws providing for this work and the rules and regulations adopted under the laws. It is stated that inspection tags covering 124,600 tons of fertilizers and cotton-seed meal and 49,536 tons of commercial feeding stuffs were sold during the year. This represents an increase of 27,600 tons of fertilizers and cotton-seed meal and a decrease of 3,640 tons of feeding stuffs. The inspection yielded a total revenue of $43,535.

METEOROLOGY—WATER.

A search for fluctuations in the sun's thermal radiation through their influence on terrestrial temperature, S. Newcomb (*Trans. Amer. Phil. Soc., n. ser., 21 (1908), No. 5, pp. 309–387; abs. in Amer. Jour. Sci., 4. ser., 26 (1908), No. 151, p. 93*).—The conclusions drawn from a thorough review of this subject are essentially negative in character, "although the observations made by Langley and later at the Astrophysical Observatory at Washington have seemed

to indicate a different result." The author shows "that a careful study of the annual departures of temperature over many regions in equatorial and middle latitudes, indicates a fluctuation corresponding with the period of solar spots. The maximum fluctuation, however, for tropical regions is only 0.13° C., or, in other words, the amplitude of the change is 0.26° C., less than one-half degree Fahrenheit. The corresponding fluctuation of the sun's radiation is, hence, concluded to be 0.2 of 1 per cent on each side of the mean. In addition, there is some inconclusive evidence of changes having a period of about six years, which may be plausibly attributed to changes in solar radiation. Apart from these changes the evidence at hand indicates that solar radiation is subject to no change producing a measurable effect upon terrestrial temperature; the magnetic, electric, and radio-active emanations may be left out of account, as their thermal effect is inappreciable. The ordinary terrestrial phenomena of temperature, rainfall, and winds are thus uninfluenced by changes in the sun's radiation. That wide changes of temperature may occur, as those noted in 1903, when the temperature in Russia and Siberia, for example, was more than 20° F. above the normal, is interesting, but it is argued that these fluctuations can not be attributed to changes in the radiation from the sun, because they do not extend to regions (i. e., the equatorial) where such changes would have their greatest effect."

Anticyclones as aids to long-distance forecasts, H. E. Rawson (*Quart. Jour. Roy. Met. Soc. [London], 33 (1907), No. 144, pp. 309, 310*).—This is a brief summary of a paper recently read before the South African Association for the Advancement of Science which dealt with the progressive seasonal movements of the permanent anticyclones within the high-pressure belt of the Eastern Hemisphere. It is stated that "the cyclic movement of the belt will introduce varying periodicities into the weather of places which are situated differently with respect to the belt, and to the positions occupied in successive years by the systems moving to and fro within it."

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observr., 1 (1908), pt. 3, pp. 134–206, figs. 16, charts 4*).—This number contains the following articles: The Luminous Particle a Strong Magnet, and the Consequent Pressure Shift of Spectral Lines, by W. J. Humphreys; Note on the Difference Between Anode and Cathode Arc-spectra, by W. J. Humphreys; Temperature Inversions at the Mount Weather Observatory (illus.), by A. J. Henry; The Change of Phase Due to the Passage of Electric Waves Through Thin Plates and the Index of Refraction of Water for Such Waves, with Applications to the Optics of Thin Films and Prisms, Part II (illus.), by W. R. Blair; and Upper Air Temperatures for January, February, and March (illus.), by W. R. Blair.

The weather of Scotland in 1907, A. Watt (*Trans. Highland and Agr. Soc. Scot., 5. ser., 20 (1908), pp. 330–340*).—"This report consists of (1) a general description of the weather over Scotland from month to month; (2) a selection of rainfall returns, in which each county of Scotland is represented by one or more stations."

The year was unfavorable from an agricultural standpoint. The total rainfall was about normal, but its distribution was unfavorable, excessive rains occurring in May, June, August, and October in several districts. Low temperatures and absence of sunshine prevailed almost continuously from May to August.

Meteorology, P. Boname (*Sta. Agron. Mauritius Bul. 16, pp. 1–15*).—Observations on atmospheric pressure, temperature, precipitation, humidity, and evaporation in Mauritius during 1906 and 1907 are summarized.

Meteorological report for the year ended March 31, 1907 (*Rhodesian Agr. Jour., 4 (1907), No. 6, pp. 602–608*).—This report gives the observations made during the year by 9 barometric, 9 thermometric, and 32 rainfall stations in Rhodesia.

Map-studies of rainfall, H. R. Mill (*Quart. Jour. Roy. Met. Soc. [London], 34 (1908), No. 146, pp. 65–86, pl. 1, figs. 10; abs. in Nature [London], 77 (1908), No. 1995, p. 286*).—The object of this paper is to explain briefly how rainfall maps may be used in the study of the normal annual rainfall of the British Isles in relation to the general configuration of the land, and of the relation of the rainfall of individual years, months, and even showers to the normal. The practical applications of the results of such studies are also indicated.

In this connection emphasis is laid upon the vast national importance of accurate knowledge of the rainfall as related to the flow of streams and the rapidly increasing diversion of the water of streams for irrigation and industrial purposes.

It is stated that "the increasing strenuousness of the struggle for the possession of large water supplies is producing in England, and especially in Wales, a great amount of local jealousy and strife, for the boundaries of parishes and counties coincides but rarely with water-partings, and the argument has been brought forward again and again that the rainfall of one county should not be diverted for the use of the inhabitants of another. The feeling is intensified when the boundary to be crossed is that of a historical division of national importance, like the boundary between England and Wales, but the map study of rainfall can do something to suggest the lines on which such disputes should be settled. . . .

"Care for the water supply of the country, coming as it does from the air that knows no bounds across the land, is by no means a parochial, but in the fullest sense a national matter, and should be dealt with in the interests of the nation as a whole, the units of subdivision, when such are required, being the natural units of river basins."

Hygienic water supplies for farms, B. M. Bolton (*U. S. Dept. Agr. Yearbook 1907, pp. 399–408, pl. 1, figs. 4*).—This article discusses the importance and requirements of a sanitary water supply, sources of water supply, sources of pollution, purification of water in the soil, protection from pollution, abundance of supply, and convenience. It is stated in conclusion "that it is not usually a difficult matter to comply with all the requirements of a sanitary water supply on the farm. It requires only ordinary intelligence in selection of the site and subsequent management, besides a certain expenditure of time and money necessary for the construction of devices for protection and convenience."

SOILS—FERTILIZERS.

Relations between climate and terrestrial deposits, J. Barrell (*Jour. Geol., 16 (1908), Nos. 2, pp. 159–190; 3, pp. 255–295; 4, pp. 363–384*).—This is a series of "studies for students," and consists of a general introduction and chapters on (1) relations of sediments to regions of erosion, (2) relation of sediments to regions of deposition, and (3) relations of climate to stream transportation.

The term terrestrial deposits as used in this article is confined to fluvial and pluvial deposits rather than glacial, lacustrin, and eolian deposits.

The specific topics dealt with are character of rocks supplying sediment; relations of rainfall, temperature, and topography to erosion; separation of topographic and climatic factors and of tectonic and climatic oscillations; influence of nature of surface of deposition; climatic influences in regions of

deposition, including effects of constantly rainy, intermittently rainy, semiarid, and arid climates, and the climatic significance of color; effects of stream transportation; relations of stable climates to transportation; and effects of varying climates upon transportation.

It is shown quite clearly in this discussion that climate is a controlling factor in determining not only quantity but physical and chemical nature of terrestrial deposits, and that the influence of this factor is exerted not only in the weathering of rocks and the original formation of the sediments, but in their transportation and deposition.

It is stated that "varying powers of erosion and transportation giving rise to varying quality and quantity of sediment are seen to be the most delicate stratigraphic indicators of climatic fluctuations. On the other hand the chemical and organic conditions accompanying the deposition of the sediment upon the delta plain are more secure indicators of the stable and average climatic conditions under which the formation as a whole was made."

The fertility of some colonial soils, as influenced by geological conditions, C. F. Juritz (*Separate from Trans. So. African Phil. Soc., 18 (1907), pt. 1, pp. 7–30*).—This is substantially a revised and extended reprint of an article which has already been noted (E. S. R., 19, p. 15).

The loss of water from soil during dry weather, J. W. Leather (*Mem. Dept. Agr. India, Chem. Ser., 1 (1908), No. 6, pp. 75–116, pls. 5, fig. 1*).—Determinations of the water content to a depth of 9 ft. in fallow soil with loose surface are recorded in this paper. Samples of the soil were examined at stated intervals from March, 1906, to May, 1907.

The more important conclusions drawn from the investigations are that during a dry period water moves upward toward the surface from a limited depth only, the maximum depth in the Pusa soil experimented with being slightly over 3 ft. during the whole period of observation. Water is lost from the soil at a rate dependent upon the amount present. That is, it follows the "compound interest law." Therefore, the rate of loss is much greater immediately after rain than subsequently. "The water-retaining power of a soil after drainage has ceased is closely related to the total surface possessed by the solid particles, and it is probable that from a determination of the latter the water-holding capacity of soils may be ascertained."

The upland moor as a water distributor, K. Gangnus and P. Rosenstand-Wöldike (*Mitt. Liv-Estländ. Bur. Landeskult., Jahrb. 1906–7, pp. 42–54, 67–76*).—These articles discuss mainly the question whether the water conditions in upland moors are to any considerable extent influenced or controlled by excessive condensation of dew by the moor mosses.

Report on irrigation dry farming and soil moisture investigations, E. Nelson (*Idaho Sta. Rpt. 1907, pp. 23–46*).—This is a report of investigations made during 1907 on the Boise-Payette reclamation project at Caldwell, Idaho, in cooperation with this Office.

The investigations included studies of the duty of water on wheat, potatoes, and alfalfa, using pumped water. Moisture determinations were made to determine the effect of the different irrigations on the moisture content of the soil and losses by evaporation. These show that "the soil has a maximum moisture capacity of 32.84 per cent of the dry weight. Twenty-four hours after irrigation it rarely contained as much as 28 per cent in the first foot. The extent to which it may dry out ranged from 3.9 to 7.3 per cent in the first foot. In the second and third foot there was rarely as little as 8.7 per cent. At planting time the soil contained an average of about 7.95 per cent of available water or a total of 3.82 in. in 3 ft. of soil. The tests indicate that this is very close to the average amount of available water that the soil may contain. In a

few instances the tests show as high an average as 8.7 per cent. In the first foot it ranged as high as 16 per cent, while in the third foot it was quite often a negligible quantity."

Humus in New Hampshire soils, F. W. MORSE (*New Hampshire Sta. Bul. 138, pp. 191–203, figs. 3*).—The importance of the functions performed by humus in the soil and methods of maintaining and increasing the humus content are discussed, and determinations of the humus content of samples of soils from the station farm and from other places in the State are reported.

The percentages of humus found in typical soils of the station farm were: Sandy loam 1.81; clay loam (upper slopes) 2.1 to 2.57, averaging 2.31; clay loam (lower slopes) 2.81 to 3.09, averaging 2.93; and clay 3.33 to 5.37, averaging 4.5. "Besides these samples of our farm soils, a few lots which were received from time to time from other farms were also analyzed for humus, with the following results: Four loams contained from 2.12 per cent to 2.65 per cent, with an average of 2.32 per cent; two sandy loams contained 1.52 per cent and 1.57 per cent, respectively, and one dark loam contained 3.3 per cent." These results show that "there is a fair average proportion of humus in the soils of this State, and they are by no means worn out when compared with the soils of localities noted for fertility."

Comparisons of the humus in cropped and fallow plats on the station farm show that "continuously tilling the soil on the one hand, or cropping it with hay for a long term of years on the other hand, are unsuitable methods for handling our soils, since the former way destroys humus rapidly, while the latter does not maintain it at the highest point."

It is estimated from the analyses reported that the average loss of humus to a depth of 12 in. in a clay soil which had been frequently tilled amounted to 28,000 lbs. per acre, and in a loam soil similarly treated 22,000 lbs. per acre annually.

On the other hand there were "found in three samples of old grass land on the clay soil, which had been cropped with hay for more than 20 years, percentages of humus ranging from 2.95 to 3.69 and averaging 3.27, while the average of immediately adjoining fields, which had been under tillage for 2 years, reseeded and cropped with hay for 3 or 4 years, was 4.5 per cent. The average difference in humus between these two classes of grass land on the same soil was 1.23 per cent, which, calculated for an acre to the depth of 6 in., would be 18,450 lbs., or over 9 tons per acre.

"The new fields had of course received a dressing of manure at seeding time, but the difference in humus would be equivalent to organic matter in over 35 tons of manure per acre, which is more than is ever applied in the practice of the farm. Therefore a considerable part of the gain must have come from the decay of the turf, roots, and stubble turned under by the plow.

"It is apparent that the marked decrease in the yield of hay after 3 or 4 years' cropping is due in part to the decrease in humus and its accompanying fertilizing constituents."

The conclusion therefore seems warranted that "a rotation of crops by combining periodical rests from tillage, with additions of sod and stubble to the soil, favors the production of humus and promotes its increase."

Soil deterioration and soil humus, J. L. HILLS, C. H. JONES, and C. CUTLER (*Vermont Sta. Bul. 135, pp. 142–177*).—In this article an attempt is made to cover causes and remedies with particular reference to the humus content of soil, its benefits, maintenance, and increase.

"The depletion of the soil humus supply is apt to be a fundamental cause of lowered crop yields. The one-crop system, fallowing, shortage of manure, no green manuring; the nonuse of legumes or grasses in the rotation; deforesta-

tion, fires, the continued use of commercial fertilizers; all these tend unduly to lower the humus content. This complex organic soil ingredient supplies nitrogen and available mineral plant food, augments the water storage capacity, promotes its warmth, betters its texture and permeability, and aids microorganic growth. Seriously to lessen its content in the soil is to lower the crop-producing power of the individual farm and to impair national resources. Its lack may be diagnosed by careful observation, but it is particularly apt to be deficient in the more open and porous soils. The supply is best augmented by adequate crop rotation, using legumes and grass as renovating crops, by the free use of farm manures or by the practice of green manuring."

A short list of references to articles on the subject is given.

What the chemist has found in Pennsylvania soils, and the relation of chemistry to agriculture, W. Frear (*Penn. Dept. Agr. Bul. 157, pp. 77–94*).—This article discusses briefly the origin and general characteristics of the representative soils of Pennsylvania, reports analyses of a number of typical soils of the State, and explains in some detail the fertilizer requirements of the soils as determined by a series of cooperative fertilizer experiments with farmers in different parts of the State.

The three main types of soils considered are sedentary, alluvial, and glacial or drift soils. As measured by solubility in both strong acid and in 1 per cent citric acid, the soils are as a rule abundantly supplied with potash. A number of them, however, are deficient in phosphoric acid. A number of the soil samples examined were from limestone regions and therefore abundantly supplied with lime; others were deficient in this constituent.

The relative merits of different methods of determining the fertilizer requirements of soils are briefly discussed.

On soils derived from carboniferous limestone, A. Grégoire (*Bul. Soc. Chim. Belg., 22 (1908), No. 2, pp. 93–104; Bul. Inst. Chim. et Bact. Gembloux, 1908, No. 75, pp. 99–108; abs. in Chem. Zentbl., 1908, I, No. 17, p. 1642*).—A peculiar unproductive soil of the region of Condroz is described and analyses are reported. This soil, which is locally known as "Flin," is a compact ocherous clay containing a large amount of calcium silicate, limonite, and calcareous fossils and also a high percentage of magnesia. The peculiar character of the soil is believed to be due to decalcification of carboniferous limestone, resulting in a lack of flocculation of the clay produced, and not to an excess of magnesia. In view of the fact that the restoration of the lime would be a difficult operation, the author recommends that the soils can best be utilized and improved by putting them down in grass and liming at frequent intervals.

Where crop yields are curtailed by lack of phosphoric acid and lime in the soil, A. Agee (*Penn. Dept. Agr. Bul. 157, pp. 94–102*).—This article calls attention to the fact that while limestone soils are usually fertile soils, abundantly supplied with both lime and phosphoric acid, there are cases in which such soils are benefited by the application of lime and phosphates. The more general use of ground limestone and of fine ground raw phosphate is recommended, particularly in connection with the growth of leguminous crops.

A contribution to knowledge of the composition of buntersandstein soils, R. Hornberger (*Ztschr. Forst u. Jagdw., 40 (1908), No. 2, pp. 94–102; abs. in Zentbl. Agr. Chem., 37 (1908), No. 9, pp. 577–579*).—Detailed chemical studies of typical soils of this kind are reported.

Some representative soils, H. Ingle (*Transvaal Agr. Jour., 6 (1908), No. 22, pp. 238–243*).—Chemical analyses of several samples from each of three districts of the Transvaal are reported, with brief discussions of their fertilizer requirements.

Analysis of grain soils [of Cape of Good Hope], C. F. Juritz (*Agr. Jour. Cape Good Hope, 32 (1908), No. 2, pp. 228–230*).—Mechanical and chemical

analyses of two typical virgin loam soils from the most productive grain-growing region of the province are reported. The soils contain about the same amount of phosphoric acid (0.04 to 0.05 per cent) found in the ordinary soils of the region, but are much above the average in the amount of lime (0.1 to 0.6 per cent) and potash (0.6 to 0.9 per cent). The mechanical analyses are compared with such analyses of typical wheat soils of the United States as are reported by Snyder. A general agreement is noted.

The development of the modern plow in relation to the chemical and bacteriological theories of soil fertility, C. Hugues (*Bol. Quind. Soc. Agr. Ital., 13 (1908), No. 4, pp. 122–126*).—The history of the development of the plow with special reference to its adaptation to the purpose of putting the soil in the best condition for promoting beneficial chemical and bacterial activities is briefly discussed.

Natural agencies in soil improvement, E. B. Voorhees (*Penn. Dept. Agr. Bul. 157, pp. 63–76*).—This article discusses in a general way what are termed constructive and destructive natural forces and explains practical systems of farm management designed to improve two opposite types of soil, namely, a heavy clay and a light sand, both deficient in vegetable matter and in lime, though with good natural drainage.

The productiveness of the soil: Bacteriological factors, E. Marchal (*Ann. Gembloux, 18 (1908), No. 3, pp. 153–166*).—This article supplements previous articles dealing with the physical and chemical factors of soil fertility (E. S. R., 20, p. 16). It discusses specialization and localization of bacterial functions in the soil and the intervention of micro-organisms in soil fertility, the latter including an account of the efforts which have been made to control and promote by artificial means the bacterial activities which increase soil fertility.

The problem of soil bacteriology, H. Fischer (*Deut. Landw. Presse, 35 (1908), Nos. 20, pp. 215–217; 21, pp. 231, 232*).—The importance of bacteriological activities, especially in fixing and transforming nitrogen, in the soil and the methods of studying and controlling such activities are discussed, but in the author's opinion more fundamental knowledge of soil bacteriological processes is needed before practical applications of value can be made. Of first importance at present is a simple method of determining the bacteriological character of soils.

The microbiochemical processes of ammonization in cultivated soils, R. Perotti (*Atti R. Accad. Lincei. Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 16 (1907), II, No. 10, pp. 704–709; Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 15–17, pp. 514–518), abs. in Chem. Zentbl., 1908, I, No. 5, p. 481; Jour. Chem. Soc. [London], 94 (1908), No. 544, II, p. 124*).—The author has shown that calcium cyanamid is ordinarily converted into ammonia in the soil while its derivative, dicyandiamid, does not undergo this change under ordinary conditions. He concludes that the transformation in the first case is a biochemic process resulting from the action of organisms which by the aid of particularly favorable conditions are able to withstand the poisonous properties of the cyanamid. The organisms apparently protect themselves by transforming the poisonous cyanamid into ammonia. In case of the dicyandiamid, on the other hand, the necessity for such transformation does not exist because in ordinary concentrations this substance is not poisonous, and certain of the organisms directly assimilate it. This conclusion is borne out, in the author's opinion, by the results of experiments which he reports in which an increase in concentration of the dicyandiamid solution resulted in ammonization due, it is believed, to the fact that in concentrated solution the diamid became injurious to the organisms. A bibliography of 21 references to literature on this particular phase of the subject is given.

Influence of organic matter on nitrification in impure cultures, A. Karpinski and B. Niklewski (*Bul. Acad. Sci. Cracovie, 1907, pp. 596–615; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 544, II, p. 123; Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 18–20, p. 618; Chem. Zentbl., 1908, I, No. 13, p. 1317*).—Small amounts of organic matter such as is furnished by soil extracts, humates, and acetates, and even peptones and sugar, favored nitrification in mixed cultures.

On the production of carbon dioxid in cultivated soil, T. Marr (*Meded. Proefstat. Oost-Java, 4. ser., 1908, No. 38, pp. 503–542, charts 3*).—Detailed studies of carbon dioxid production in manured and unmanured soil are reported. The results in the main substantiate those reported by Stoklasa and Ernest (E. S. R., 18, p. 1024), as showing the very large production of carbon dioxid in cultivated soils.

On the action of carbon bisulphid and similar substances on the soil, K. Störmer (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 8–9, pp. 282–286; abs. in Chem. Zentbl., 1908, I, No. 10, p. 980*).—Experiments with carbon bisulphid, chloroform, ether, benzol, hydrogen peroxid, arsenic, toluol, xylol, phenol, carbol, and cresol are reported. The fact that higher plants were not killed by the amounts of these poisons which were used is explained as due to evaporation of the volatile poisons and fixation of the metallic poisons. It was found that certain of the organic substances, such as carbol and cresol, were utilized to some extent by the bacteria as a source of carbon, particularly if the substances were not used in too concentrated solution. The assimilation of the carbon was shown by increased production of carbon dioxid. The beneficial effect observed in the case of carbon bisulphid is attributed in part to conversion of the sulphur to SO_3 but mainly to the setting free of nitrogen from the plasma of cells killed by the poison, the nitrogen thus being rendered available for plants.

A denitrification experiment, H. Fischer (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 8–9, pp. 256, 257; abs. in Chem. Zentbl., 1908, I, No. 10, p. 981*).—The author's observations indicate that continued denitrification in the same medium does not always result in the formation of antibodies which eventually stop the process. He believes that the checking of denitrification under such conditions is sometimes due to the formation of free sulphur. In the experiment which is reported it was found that the addition of citric acid completely prevented denitrification. When, however, the acid was neutralized denitrification went on normally. The addition of sodium citrate to the cultures proved very favorable to denitrification. The addition of asparagin was found to be unnecessary except in the case of certain denitrifying bacteria which can not live on nitrate nitrogen alone but also require amid nitrogen in order to reduce nitrates.

The reduction of nitrates, E. Laurent (*Rec. Inst. Bot. Univ. Bruxelles, 1907; abs. in Bul. Assoc. Chim. Sucr. et Distill., 25 (1908), No. 8, p. 780*).—It is pointed out that under the influence of sunlight nitrates either dry or in solution are reduced to nitrites independently of the influence of the air. Beer yeasts, especially those of Duclaux, reduce nitrates at 20° C. *Penicillium glaucum*, *Mucor racemosus*, and similar organisms also have a reducing power. Germinating seeds and various kinds of tissues produce nitrates when air is excluded.

Note on dialysis of soils, C. V. Garola (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 562–569, fig. 1*).—Verifying Petermann's results it was found that soils yielded to solution in water when subjected to dialysis through parchment paper considerable amounts of potash and phosphoric acid, the amounts

varying, however, with the character of the soil. It is suggested that dialysis may prove a useful method of studying the available plant food in soils. By the use of antiseptics in the soil samples experimented with it was shown that the dialyzable plant food obtained was not due to the solvent action of micro-organisms in the soil.

The analysis of the soil by cultivated plants, A. Proost (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 451–457*).—This is mainly a plea for more thorough study of the physics of plant growth and of the relation of natural flora to the physical properties of the soil.

A simple method of testing the manurial wants of soils (*Dept. Agr. Bengal, Quart. Jour., 1 (1908), No. 3, pp. 140–143, fig. 1*).—A simple arrangement of 8 plats, each 10 yds. square, for testing the need of soils for potash, nitrogen, and phosphoric acid singly and combined is described.

Testing soils for fertilizer needs, F. W. Taylor (*New Hampshire Sta. Circ. 2, pp. 2*).—A simple method of making fertilizer tests is briefly described.

The results of practical fertilizer experiments, P. Wagner (*Chem. Ztg., 32 (1908), No. 19, pp. 233, 234*).—The author summarizes the results of 6 years' cooperative experiments with fertilizers carried out under the auspices of the German Agricultural Society by the agricultural experiment stations of the German Empire and reported from time to time in bulletins of the society (E. S. R., 19, p. 925). It is stated that these experiments have demonstrated, among other things, the proper method of fertilizing grapes, the beneficial effect of potash fertilizers on tobacco, the exhaustion of soil potash by meadow grasses and the beneficial effect of phosphatic and nitrogenous fertilizers on grasses, the determination of the soils and crops on which potash salts rich in chlorin can be used, the resistance of sugar beets to large amounts of chlorids, the special need of potatoes and barley for potash and of leguminous plants for phosphoric acid, and the more rational handling and use of manure.

These experiments have also demonstrated the important fact that all of the factors of production, including soil preparation, selection of varieties, amount of seed, methods of planting, etc., must work together if the optimum production is to be obtained. With an optimum of all these factors the yield may be increased in the case of rye 890 to 1,500 lbs. per acre, with barley 980 to 1,600 lbs. per acre, with oats 1,100 to 1,800 lbs. per acre, and with rye on the poorest land, 440 to 1,100 lbs. per acre.

While fertilizing is not the only factor of production it is one of the most important, but the profit from the use of fertilizers depends largely upon the condition of the fertilizer market. The supply of phosphatic and potassic fertilizers is abundant. The future supply of nitrogenous fertilizers is more uncertain. The author attaches great importance to the utilization of processes of fixation and assimilation of atmospheric nitrogen by means of micro-organisms and also to artificial processes of preparing nitrogen compounds from atmospheric nitrogen. The latter he considers the most important question affecting the fertilizer market at the present time.

Increase and decrease of nitrogen in the soil by manuring (*Armstrong Col., Newcastle-upon-Tyne, Agr. Dept. Bul. 7, pp. 30–32*).—The results of fertilizer experiments during a series of years on hay land are briefly referred to as showing that "the judicious application of phosphatic manures, with the addition of potash manures if needed, is the most economical method of supplying nitrogen to the soil, this being taken indirectly from the air by means of the root nodules of clover plants; and further that the continued application of active nitrogenous manures will ultimately greatly impoverish the soil in nitrogen."

The sources of nitrogen and nitrogen fertilizing, W. Schneidewind (*Die Stickstoffquellen und die Stickstoffdüngung. Berlin, 1908, pp. VII+139; rev. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 13–14, pp. 437–440*).—This book summarizes present information on these subjects under the following heads: General considerations relating to gain and loss of nitrogen through natural processes, fallow, green manuring, barnyard manure, nitrogenous fertilizers, nitrogen removed from soils by different crops, and fertilizers for special crops.

The content of combined nitrogen in the air, P. Vageler (*Fühling's Landw. Ztg., 57 (1908), No. 4, pp. 140–151*).—This article gives a very complete summary of data on this subject. The principal deduction drawn from the data is that the amount of nitrogen carried down to the soil in atmospheric precipitation is too small to be of very great practical significance, and for this reason we must look to the soil organisms which fix free nitrogen for any important increase in the nitrogen of the soil from atmospheric sources.

The nitrogen problem in agriculture (*Nature [London], 77 (1908), No. 1997, pp. 330, 331*).—This is a review of a report by W. B. Bottomley on seed and soil inoculation for leguminous crops, which is mainly a summary of practical experiments with the pure cultures prepared and distributed in Great Britain by him. The worthless character of most of these reports from a scientific standpoint is pointed out, as well as the extravagant character of some of the claims made by Professor Bottomley with reference to the benefits which may be obtained from the use of the inoculating material.

Field experiments with different nitrogenous fertilizers, Kleberger (*Illus. Landw. Ztg., 28 (1908), No. 21, pp. 185–187*).—Comparative tests of nitrate of soda, sulphate of ammonia, and nitrogen lime on rape, oats, potatoes, sugar beets, and fodder beets are reported. The effects of applications of barnyard manure and of green manuring were also tested.

Norwegian and Chilean nitrate, H. von Feilitzen and L. Grandeau (*Jour. Agr. Prat., n. ser., 15 (1908), No. 7, pp. 196–198*).—A brief account is here given of comparative tests of these materials at the Swedish Moor Culture Stations at Jönköping and Flahult. See also a previous note (E. S. R., 19, p. 124).

Calcium cyanamid (nitrogen lime or lime nitrogen) as a fertilizer, H. Immendorff and K. Kempski (*Calciumcyanamid (Stickstoffkalk oder Kalkstickstoff) als Düngemittel. Stuttgart, 1907, pp. 123; rev. in Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 10, p. 304; Ztschr. Landw. Versuchsw. Osterr., 11 (1908), No. 2, pp 149, 150*).—This is a review of previous investigations and of the present status of knowledge on this subject. Chapters are devoted to consideration of (1) the nitrogen question in general, and the history of investigations relating to the utilization of atmospheric nitrogen through the agency of root tubercles and by oxidation processes; (2) the development of carbid methods; (3) various processes which have been developed for the preparation of lime nitrogen and nitrogen lime and the technical application of these processes in different places; (4) a review of information relating to the chemical and bacteriological characteristics and transformation in the soil of lime nitrogen and nitrogen lime, and of the agricultural use of cyanamid including a consideration of the possible poisonous properties of cyanamid and their influence upon vegetable and animal life; and (5) an elaborate compilation of the results of fertilizer experiments with different crops and soils in various countries.

Some of the more important facts relating to the use of calcium cyanamid as a fertilizer brought out in this discussion are as follows: The material is not suited to acid humus soils nor to light sandy soils of acid reaction. It is

an effective fertilizer on all other soils, particularly on fine clay soils of high absorptive power and rich in lime, especially when such soils are regularly treated with stable manure. Under favorable conditions the cyanamid is considered to be equal to ammonium sulphate in fertilizing efficiency when used at rates of 133.6 to 267.2 lbs. (26.7 to 53.4 lbs. of nitrogen) per acre. It should be applied 2 to 8 days before seeding and well mixed with the soil immediately after application. It should never be applied as a top-dressing and should not be mixed with superphosphates, but may be mixed with potash salts and Thomas slag. The material should be kept dry in storage, otherwise there will be decomposition and loss of nitrogen. If applied with a drill some device should be used which will prevent scattering by the wind. If applied by hand the material should be mixed with double its weight of moist soil.

Results of experiments with calcium cyanamid on horticultural crops and on wheat, R. de Polo (*Asoc. Sal. Propagada, Circ. Trimest. 43, 1908, pp. 151–159*).—The results of a number of experiments made during 1905–6, mainly in Italy, are summarized.

Calcium nitrate and calcium cyanamid, L. Grandeau (*Jour. Agr. Prat., n. ser., 15 (1908), No. 8, pp. 229–231*).—The more important practical information regarding the value and use of these materials as fertilizers is summarized and a brief account is given of tests of the calcium nitrate on potatoes and wheat during the season of 1906–7. The nitrate gave favorable results in both cases.

A danger in the use of nitrogenous fertilizers in the cultivation of grain, D. Cavazza and L. Zerbini (*Ann. Uffic. Prov. Agr. Bologna, 13 (1906), pp. 91–103*).—From the experiments reported the authors conclude that nitrogenous fertilizers, especially the soluble forms, should be used with caution, otherwise there may be great waste.

On the potash fertilizing of tropical and subtropical plants, P. Vageler (*Tropenpflanzer, 12 (1908), No. 2, pp. 69–83*).—This article reviews various investigations which have been made on the potash requirements of tropical and subtropical soils and crops, including a number of references to work by experiment stations of the southern United States. The crops which receive attention include barley, wheat, rice, sugar cane, sweet potatoes, oil plants, tobacco, coffee, cacao, tea, cotton, sisal, and cocoanuts.

The general conclusion reached is that soils of tropical and subtropical regions are frequently deficient in potash and that good results generally follow the use of potash fertilizers on the crops ordinarily grown in such regions. The best forms and methods of use and the profitableness of potash fertilizing depend upon varying conditions which have not yet been thoroughly investigated.

Potash fertilizers, D. Cavazza (*Ann. Uffic. Prov. Agr. Bologna, 13 (1906), pp. 150–159*).—Experiments are reported which indicate that on certain clay soils potash fertilizers are not needed.

The farming of light soils with special reference to the use of potash salts, Kitzinger (*Jahrb. Deut. Landw. Gesell., 22 (1907), No. 4, pp. 741–752*).—This is a popular statement of practical experience in improving light sandy soils by proper rotations and methods of fertilizing, particularly with legumes and potash salts as proposed by Schultz-Lupitz.

The solvent action of soil bacteria upon the insoluble phosphates of raw bone meal and natural raw rock phosphate, W. G. Sackett, A. J. Patten, and C. W. Brown (*Michigan Sta. Spec. Bul. 43, pp. 3–30*).—This is a preliminary report covering 2 years' work and over 500 determinations, the purpose of which was "to demonstrate quantitatively, if possible, the extent to which the

tricalcium phosphate of raw bone meal and the insoluble phosphate of natural raw rock phosphate are made soluble by soil bacteria rather than to attempt any explanation of the processes involved."

It was found that many soil organisms, not specific acid producers, as, for example, *Bacillus subtilis*, *B. mycoides*, *B. proteus vulgaris*, and *B. coli communis*, as well as several agar cultures from garden soil, were capable of dissolving the phosphate of bone and to a less extent that of mineral phosphate. The authors are therefore of the opinion that acid is not the sole solvent in this process, although an important one, as shown by the greatly increased solvent action in cultures of the acid-producing organisms, *B. acidi lactici* and "mother of vinegar," in milk and fermented wort.

The carbon dioxid liberated by the organisms also appear to be an important factor in dissolving the phosphates. The investigations show further that the character of the culture solution has an important bearing upon the solvent action. With the nonacid-producing organisms the greatest solvent effect in case of bone meal was obtained in a culture solution made up of sodium chlorid, potassium sulphate, and ferrous sulphate, with asparagin as the source of nitrogen. Organisms grown in an agar medium containing also magnesium and ammonium sulphates exerted no solvent action on either calcium carbonate, dicalcium or tricalcium phosphate, bone meal, or mineral phosphate. When, however, sugar was added, the phosphates were attacked, as also when meat extract was added, although the action in this case was much reduced.

The solvent action of soil bacteria upon the insoluble phosphates of raw bone meal and natural raw rock phosphate, W. G. Sackett, A. J. Patten, and C. W. Brown (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 21–23, pp. 688–703; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 547, II, p. 415*).—See abstract above.

On the action of agricultural phosphate, O. Böttcher (*Deut. Landw. Presse, 35 (1908), No. 23, pp. 253, 254*).—Pot and field experiments by the author to test the fertilizing value of this material, which is a fine ground raw phosphate, are reviewed, the general conclusion being that this material can not replace superphosphate as an efficient phosphatic fertilizer and in general confirming the view expressed in the resolution adopted by the Association of Agricultural Experiment Stations of the German Empire at its Dresden meeting to the effect that raw phosphates can not be profitably used on any except acid soils and that their use on other soils is not to be recommended.

Fertilizer experiments with Thomas slag, L. Jozek (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 404–407*).—In experiments with beets no increase in yield was observed when Thomas slag was used alone. There was, however, a considerable increase when nitrate of soda and sulphate of potash were used with the slag. In the case of barley the addition of the nitrate or sulphate did not materially increase the yield produced by Thomas slag alone.

Results of cooperative experiments with fertilizers in swamp soils, R. Harcourt (*Ann. Rpt. Ontario Agr. and Expt. Union, 29 (1907), pp. 48–51*).—A number of such experiments in different parts of the Province of Ontario are reported, the general conclusion being that in the majority of cases lime gave decidedly beneficial results and that potash and phosphoric acid may be profitably used on many of the soils.

The action of lime on the bacterial life in soils, Vogel (*Illus. Landw. Ztg., 28 (1908), No. 21, p. 185; abs. in Chem. Abs., 2 (1908), No. 15, pp. 2119, 2120*).—This is a brief summary of results of some of the more recent investigations regarding the beneficial influence of lime on nitrification, putrefaction, and nitrogen fixation in the soil. The general conclusions are that the activities of all soil micro-organisms are promoted by lime and that this explains the

value of lime as a plant food. The minimum lime requirements of Azotobacter in the soil is estimated to be 0.1 per cent.

The action of various combinations of manganese and particularly of a manganiferous mineral used as a fertilizer for plants, N. Strampelli (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 14–17*).—Plat tests with grain are reported in which manganese carbonate, sulphate, and dioxid, and a manganese ore were used in combination with other fertilizing materials. An increase of yield due to addition of the manganese compounds was observed in all cases, the greatest increase resulting from the use of the sulphate.

The use and increasing production of sulphate of ammonia, T. Collot (*Jour. Agr. Prat., n. scr., 15 (1908), No. 10, pp. 301–304*).—The total production of sulphate of ammonia for the whole world in 1907 is placed at 845,000 metric tons, valued at $50,700,000. Of this amount England produced 361,000 tons and the United States 36,000 tons. The production in Germany has increased from 55,000 tons in 1896 to 287,000 tons in 1907. France produced during the year 53,000 tons and consumed 72,900 tons.

The value of sulphate of ammonia as a fertilizer for various crops, particularly cereals, beets, and potatoes, is discussed, and the importance of increasing the production of this material as a by-product of coke making and by distillation of peat is pointed out.

The utilization of the nitrogen of the air in Germany, Kempski (*Naturw. Wchnschr., 23 (1908), No. 12, pp. 185, 186*).—This note refers to the processes now in actual use and the manufacturing plants in operation in Germany and other European countries for the preparation of nitrogenous compounds from the nitrogen of the air. The processes mentioned are those of Birkeland and Eyde for the preparation of lime nitrate and of Frank and Caro and of Polzenius for the preparation of calcium cyanamid. The plants referred to are those of Piano d'Orta in Italy, Westeregeln, near Stassfurt, in Germany, with an output of about 4,400 tons of nitrogen lime per year, and Brühl, near Cologne, with an output of about 11,000 tons per year. The technical application of Ostwald's process for the conversion of the nitrogen of nitrogen lime into ammonia is also noted.

On the utilization of atmospheric nitrogen by means of calcium and barium, A. Piccinini (*Atti 6. Cong. Internaz. Chim. Appl., 3 (1906), pp. 215–226*).—The history and chemistry of fixation of atmospheric nitrogen by electrical means, especially the calcium cynamid process, is reviewed and a bibliography of 23 references to investigations on the subject is given.

The action of certain fertilizers on calcium cyanamid, G. Fascetti (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 372–378*).—A study of the effects of mixing superphosphates, slag, and mineral phosphates in varying proportions with calcium cyanamid is reported.

On the chlorin content of kainit, J. C. de Ruijter de Wildt (*Cultura, 20 (1908), No. 235, pp. 155–160*).—The percentages of potash and chlorin in 59 samples of commercial kainit are reported. The percentages of lime, magnesia, and sulphuric acid are also given for some of the samples. The chlorin varied from 28 to 50.8 per cent, the potash from 10.8 to 17.1 per cent. As a rule the potash increased with the chlorin content.

Investigations on the composition of Peruvian guano and its value as a fertilizer, J. G. Maschhaupt (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat., 1908, No. 3, pp. 5–21*).—This article contains information regarding the origin, formation, and character of the guano deposits, as well as recent analyses and a discussion of the fertilizing value of the guano.

The utilization of locusts as fertilizer, P. Lavenir (*An. Soc. Rural Argentina, 41 (1907), No. 53–54, pp. 179–181*).—Analyses of the whole insect and of its different parts are reported. The dried and ground material (whole insects) was found to contain 9.86 per cent of moisture, 9.94 per cent of fat soluble in benzin, 9.71 per cent of nitrogen and 1.24 per cent of phosphoric acid. The analyses thus indicate a high fertilizing value for the material.

Mineral fertilizer, J. A. Wendel (*Milwaukee, Wis., 1908, pp. 24*).—This pamphlet is practically an abridgment of a book published several years ago under the title Bread from Stones, and advocates the exclusive use of finely ground rocks as a means of maintaining soil fertility.

On the absorptive capacity of peat litter when under high pressure, I. Lugner and H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 22 (1908), No. 1, pp. 36–41, figs. 3*).—Experiments conducted by the authors showed that peat litter with a high absorptive power is able to retain larger quantities of liquids than a poor grade of litter, even if subjected to pressures of 0.8 to 1.6 lbs. per square inch, corresponding to the pressure to which litter is subjected in a manure pile up to a depth of 1 meter.

Fertilizer trade in Hawaii, A. Marquès (*Engrais, 23 (1908), No. 9, p. 209*).—It is reported that fertilizers to the value of $698.241 were imported into Hawaii from the United States during the year 1906–7. This represents 80 to 85 per cent of the total amount used.

Commercial fertilizers; a quarter century of fertilizer inspection, J. L. Hills, C. H. Jones, and C. Cutler (*Vermont Sta. Bul. 135, pp. 59–141, dgms. 10*).—The results of analyses of 130 brands of fertilizers, representing the output of 11 companies, are reported and discussed in this bulletin. A survey of 25 years' fertilizer inspection in Vermont is also given: "A fertilizer control has been conducted in Vermont since 1882. Before the system was inaugurated fertilizers contained no potash, were very irregular and uncertain in composition, were costly, and fraud was rife. To-day the trade is systematized, brands are relatively uniform year after year, and seriously deficient fertilizers are uncommon." The quality of the fertilizers examined during the past year was on the whole good.

Mixing chemical fertilizers on the farm, F. W. Morse (*New Hampshire Sta. Circ. 1, pp. 4*).—It is maintained in this article that "mixing chemical fertilizers is a simple mechanical process and can be done by any farmer," and formulas and methods are given.

AGRICULTURAL BOTANY.

The relation of plant societies to evaporation, E. N. Transeau (*Bot. Gaz., 45 (1908), No. 4, pp. 217–231, figs. 9*).—A study was made at about one dozen stations on Long Island, N. Y., by means of the porous-cup vaporimeter tested and recommended by the Desert Botanical Laboratory at Tucson, Ariz., to determine the relation between evaporation in the soil and the plants occupying any given locality. It was found that the porous-cup vaporimeter is well adapted to the study of habitat conditions. Unlike many forms of instruments, it furnishes data that can be directly related to the plant activity. Comparative readings can be obtained from different habitats by standardizing the instruments at the beginning of the experiments.

Does phosphorus play a part in the production of chlorophyll? J. Stoklasa, V. Brdlik, and J. Just (*Ber. Deut. Bot. Gesell., 26a (1908), No. 1, pp. 69–78*).—The former conclusions of one of the authors on the physiological importance of phosphorus in the formation of chlorophyll (E. S. R., 8, p. 108) having been questioned, the previous experiments, in which leaves were extracted with ben-

zol and the percentage of phosphorus in the extract estimated as magnesium phosphate, have been repeated. The principal experiments were made with *Acer pseudoplatanus*, but the results were confirmed by analysis of 18 other plants. All showed an important phosphorus content in the ash. The authors reassert the previous statement that phosphorus plays an important rôle in the production of chlorophyll.

Lactic and alcoholic fermentation in plant tissues. J. Stoklasa (*Atti 6. Cong. Internaz. Chim. Appl., 3 (1906), pp. 885–890*).—The author gives a brief account of studies on intramolecular respiration of beet roots, potato tubers, beans, cucumbers, cherries, wheat, and barley, in which a lactic and alcoholic fermentation was found to take place. This fermentation, it is claimed, is due to an enzymic action, bacteria having nothing to do with it.

The effect of light on germination, W. Kinzel (*Ber. Deut. Bot. Gesell., 26a (1908), No. 2, pp. 105–115, dgms. 4*).—A study was made to determine the effect of light and darkness, as well as of various colored lights, upon the germination of seeds of a number of species of plants.

In the case of Veronica seeds 100 per cent germinated under clear light and under yellow light in 30 days, while germination was retarded under orange, red, blue, and green light, in some cases less than 50 per cent germinating in 2 months.

Similar investigations were conducted with the seeds of Poa, Nicotiana, Drosera, Allium, Veratrum, and other plants.

The stimulating action on germination of mixtures of colloidal solutions. H. Micheels and P. DeHeen (*Acad. Roy. Belg., Bul. Cl. Sci., 1907, No. 12, pp. 1027, 1028*).—In continuation of previous work on the action of colloidal solutions in stimulating germination (E. S. R., 18, p. 624), results are given of investigations carried on with colloidal solutions of platinum and of magnesium and a mixture of equal parts of the two. The solutions were found to exercise a stimulating effect on the germination of wheat, and the combined solution increased the percentage of germination very materially.

The ascent of water in trees, A. J. Ewart (*Phil. Trans. Roy. Soc. London, Ser. B, 199 (1908), No. 258, pp. 341–392, pl. 1, figs. 7*).—In continuation of previous investigations into the physics of water flow through wood (E. S. R., 17, p. 958), the author has carried on experiments on the ascent of water, measuring it in maple and poplar trees, wistaria, and other plants.

The author states that all his experiments tend to show that the continuous ascent of water is only possible in living wood, the power of conduction being rapidly lost on death, without any mechanical blocking of the vessels being necessarily responsible for the change. From this he concludes that the living cells in tall trees continually restore the conditions for the ascent of water wherever these are affected by the excessive emptying of the vessels, and decrease the resistance to flow as far as possible by maintaining continuous water columns in at least parts of the wood. So long as these are present, a pumping action on the part of the tree becomes necessary only in those trees having a height of over 20 to 50 meters. Suspended columns of water can not be maintained for any length of time in the vessels of tall trees without the aid of the living cells of the wood.

The energy required to pump water upward in the tallest trees is said to represent only a small fraction of that produced by the daily photosynthetic assimilation, and it is this feeble character and diffuseness of the pumping action which renders it so difficult to demonstrate.

Experiments on the suction and exudation of trees at different levels and upon the influence of the entry of air and water under pressure showed that no continuous suspended water columns or high internal tensions existed in

the conducting elements of the maple and poplar trees during their active transpiration. The same was shown by direct measurements of the pressure in vessels of wistaria. This fact, coupled with the high total resistance to flow, shows that this resistance is overcome locally from point to point, and not by any enormous tension from above or pressure from below, neither of which exists nor could be maintained to a sufficient extent to carry on the elevation of water in a tall tree.

The apparent differences of osmotic pressure previously observed between leaves at the base and apex of a tall tree it is claimed are not evidences of the existence of any greater osmotic suction at the higher level, but are the result of the different ages and sizes of the cells and the different conditions to which they have been exposed.

Observations regarding the constancy of mutants and questions regarding the origin of disease resistance in plants. H. L. Bolley (*Amer. Nat., 42 (1908), No. 495, pp. 171–183*).—This is a paper read before the American Breeders' Association at its meeting in January, 1908, in which the author gives his views regarding the constancy of a number of mutating forms of plants, and also outlines the results of his investigations on the resistance to disease of various plants with which he has been experimenting.

The author, in summarizing his results, asserts "(1) that mutants may be so insignificant and numerous as to be unrecognizable and thus fall directly into the class called by DeVries 'fluctuating variations;' or (2) that they may be induced in a mixture of a great number of varieties of a species at one and the same time because of the same environmental causes; or (3) that, in some cases, 'fluctuating variations' are of such nature and worth as to allow results to be obtained in mass breeding of as great importance as any that may be hoped to be obtained by looking for a single mutating type."

In regard to disease resistance the author, while not ready to affirm definitely his position in the matter, believes that the resistance is physiological rather than structural.

The correlation of flower and fruit structure in Carica papaya. P. J. Wester (*Bul. Torrey Bot. Club, 35 (1908), No. 3, pp. 141–146, figs. 2*).—A study has been made of the papaya (*C. papaya*) to determine whether the development and formation of the fruit might be correlated with the structure of the flower. In this study notes were taken on a number of flowers on the same tree. The plant is normally diœcious, but rarely produces perfect flowers. In most instances the bisexual flower buds were bagged with small paper sacks, the sack remaining until the flower had faded and the ovary was beginning to develop.

There was found to be a distinct correlation between the formation and size of the fruit and the flower characters. Where the ovary was small and slender, with rays in the stigma nearly aborted, the fruits grew comparatively small, cylindrical, almost solid, with exceedingly small seed cavity containing few seeds; while where the pistil was normal, or nearly so, the fruit grew large, more or less angular, with the apical end distended, and the cavity containing a large number of seeds.

The author thinks the form with small slender ovaries to be preferable, as it yields a fruit that is much more easily packed. Under the usual methods of propagation a large production of seedlings is not considered profitable, and an attempt to originate a variety of papaya would probably necessitate hand pollination, inbreeding, and rigid selection for several generations.

The nectaries of cotton. F. J. Tyler (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 131, pp. 45–54, pl. 1*).—A study has been made of the nectaries occurring

on the leaves and involucral bracts of cotton to determine whether they can be used as diagnostic characters for the classification of species of Gossypium.

Symbiosis in fern prothallia, D. H. Campbell (*Amer. Nat., 42 (1908), No. 495, pp. 154–165, figs. 3*).—Attention is called to the fact that the author reported in 1895 the presence of an endophytic fungus in the prothallium of *Botrychium virginianum*. Studies have since been made of a number of other species of ferns that show conclusively that an endophytic fungus is normally present in the green prothallia of several additional species, and it is highly probable that further research will show similar fungus endophytes in other ferns.

FIELD CROPS.

Dry farming in Idaho, E. Nelson (*Idaho Sta. Bul. 62, pp. 3–42, figs. 2, map 1*).—Experiments were carried on near Caldwell by the station in cooperation with this Office to determine the best methods of cultivation for different dry-land crops. These experiments were begun in October, 1906, and as the work in 1907 was largely preliminary only few references to results obtained are made. The bulletin treats of dry farming in a general way, giving its history, discussing climatic and soil conditions in regions where dry farming is practiced or is feasible, and describing the advantages of different methods followed in producing crops under dry-land conditions. The monthly precipitation at 46 different points in the State for recent years is given in a table. At Caldwell the yearly precipitation is 10.32 in.

It is stated that the surface soil in the Snake River plains will hold per cubic foot 18.65 lbs. of moisture in the form of capillary water, or 22.46 per cent of the dry weight of the soil. The author observed that a certain deep clay loam had become moist to the depth of only 18 in. during winter. When tested in April it contained 4.85 in. of water in the first 3 ft. of soil, but in the latter part of August it contained only 2.32 in., and this entirely hygroscopic moisture. The rainfall during the period had been 4.53 in., thus making a total of 7.06 in. evaporated in 3 months. The tests were made on unbroken ground. On summer fallow plats at Caldwell, which had been disked and harrowed early, the moisture content in June after plowing and establishing a dry mulch was 7.03 in. in 3 ft. of soil, while late in September it was still 6.55 in., showing a loss of only 0.48 in. The moisture content on new land plowed in spring and cropped in 1907 was 16.63 per cent, 19.20 per cent, and 17.04 per cent for the first, second, and third foot, respectively, at planting time, and 5.98 per cent, 10.88 per cent, and 13.17 per cent for the first, second, and third foot, respectively, at harvest time.

The different varieties enumerated as adapted to southern Idaho dry-land conditions are as follows: Winter wheat, Turkey Red, Forty-fold, Gold Coin, Lofthouse, Jones Fife, Odessa, and Canada Hybrid; spring wheat, Kubanka, Bluestem, Little Club, Red Chaff, Jenkins, Early Wilbur, and Sonora; oats, Sixty Day, Kherson, Big Four, and Black American; barley, Beardless and Smooth Hulless; potatoes, Early Ohio, Early Acme, Six Weeks, and Early Eureka. Rye, emmer, Polish wheat, alfalfa, field peas, Dwarf milo maize, white durra, flint corn, and brome grass are also successfully grown.

On the plains about 15 bu. of wheat per acre may be grown by dry-farming methods. It is estimated that the cost of producing wheat in Idaho, not including thrashing and marketing, is $3 per acre when the work is performed by the farmer, and $5.30 per acre when the work is contracted.

Dry-land farming in the Great Plains area, E. C. Chilcott (*U. S. Dept. Agr. Yearbook 1907, pp. 451–468, figs. 2*).—This article discusses the Great Plains area as a field for investigation, considers the climate of the region and

its effect upon soil conditions, and describes cooperative work of this Department undertaken with State experiment stations.

Outlines and plans of experiments in soil preparation and crop rotation are presented. The object of these experiments is to determine a system of cultivation which will best conserve the soil moisture for the uses of the growing crop. Nine rotations planned are designed for the conservation of humus in the soil, and nine 3-year rotations are designed to give an opportunity for comparing the several rotations considered as units and also for comparing the several crops grown in different rotations under different systems of soil preparation and following different crops.

Notes on dry farming, W. M. JARDINE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 10, pp. 6*).—These notes include a brief review of dry-land agriculture in Montana, Utah, and Colorado.

In the Yellowstone Valley of Montana at an altitude of 2,500 to 3,000 ft., with an average annual precipitation of 13 to 15 in., yields of 58 bu. of Turkey Red wheat, 2 tons of alfalfa, 250 bu. of potatoes, and 60 bu. of oats per acre are recorded. The two principal varieties of wheat grown are Turkey Red winter wheat and Kubanka durum spring wheat. The winter wheat is reported as yielding 10 to 20 bu. more per acre than the best spring wheat known. Observations made on plowing with gasoline traction engines are reported.

In the Bear River Valley of northern Utah and the Malad Valley of southern Idaho, regions with an annual rainfall of less than 13 in. and with an average of less than 5 in. during the growing season, the author found that a yield of 15 bu. of wheat per acre is secured with only an occasional rotation of the crops or summer fallow.

Orchard management on a dry farm near Denver, Colo., is briefly described. In addition to orchard crops, currants, alfalfa, corn, wheat, and potatoes are also produced. The alfalfa is reported as yielding annually from 1½ to 2½ tons of hay per acre, while in 1907 Turkey Red wheat yielded over 40 bu. per acre. The same season 40 bu. of corn per acre were produced on sod land plowed 9 in. deep. In discussing the cultivation of this farm, the advantage of using the moldboard plow instead of the disk plow in dry-land farming is pointed out.

Cropping systems for stock farms, W. J. SPILLMAN (*U. S. Dept. Agr. Yearbook 1907, pp. 385–398*).—In treating this subject the author gives examples of simple and complex rotations and outlines cropping systems for special types of stock farms, including a Virginia horse farm, a northern dairy farm, a dairy farm in a middle latitude, and a hog farm in a region a little south of middle latitude.

Results of cooperative experiments in agriculture, C. A. ZAVITZ (*Ann. Rpt. Ontario Agr. and Expt. Union, 29 (1907), pp. 14–32*).—A report and discussion of the work in 1907 is presented.

The number of tests made of each crop, the leading variety, and its average yield were as follows: Oats, 102 tests, Imported No. 534, yield 37.44 bu.; Six-rowed barley, 42 tests, No. 21, 30.98 bu.; Two-rowed barley, 3 tests, French Chevalier, 23.88 bu.; Hulless barley, 6 tests, Black Hulless, 18.92 bu.; Spring wheat, 13 tests, Wild Goose, 20.05 bu.; emmer and spelt, 5 tests, common emmer, 44.20 bu.; Winter wheat, 8 tests, Imperial Amber, 22.17 bu.; Winter rye, 2 tests, Mammoth, 26.43 bu.; field peas, 42 tests, Early Britain, 20.53 bu.; field beans, 12 tests, New Prize Winner, 20.59 bu.; corn for grain, 12 tests, Genesee Valley, 33.21 bu.; crop mixtures, 4 tests, Daubeney oats, 34 lbs. and Mandscheuri barley, 48 lbs. per acre, 1,340 lbs. of grain; mangels, 10 tests, Ferry Yellow Leviathan, 36.77 tons; sugar beets, 8 tests, Bruce Giant White Feeding, 25.43 tons; swedes, 4 tests, Carter Invicta, 32.18 tons; fall turnips and kohl-rabi, 3 tests, Redtop White Globe fall turnip, 29.55 tons; carrots and parsnips, 2

tests, Bruce Mammoth Intermediate Smooth White carrot, 20.60 tons; millet, 3 tests, Japanese common, 10.44 tons; grass peas and vetches, 1 test, hairy vetches, 9.20 tons; potatoes, late varieties, 89 tests, Empire State, 157.78 bu., medium varieties, 108 tests, Burpee Extra Early, 151.18 bu., early varieties, 217 tests, Extra Early Eureka, 149.58 bu. Cooperative fertilizer tests with a number of these crops are also described and reported.

[Effects of manures on old land hay], D. A. GILCHRIST (*Armstrong Col., Newcastle-upon-Tyne, Agr. Dept. Bul. 7, pp. 33*).—Cooperative fertilizer experiments were carried on in the counties of Cumberland, Durham, and Northumberland, and the results are here reported, together with suggestions for the manuring of old land hay and pasture.

It is concluded from the results secured that on heavy soils phosphatic manures alone are as a rule most profitable for old land, while on the lighter soils potash should be added to the phosphatic manure. Nitrogenous manures either alone or in combination did not appear profitable. On heavy soils phosphatic manures favored the development of leguminous plants, while on the lighter classes of soils a potash manure was also required to produce this effect. Basic slag was the most effective source of phosphorus, especially on heavy soils. Although bone meal gave good results, it was slower in its action than basic slag.

The botanical history and classification of alfalfa, C. S. SCOFIELD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 131, pp. 11–19, figs. 2*).—This article discusses the origin of the alfalfa plant and its common names, its early scientific name, the confusion of generic names, the type of the genus Medicago as well as that of the genus Medica, and the seed characters of alfalfa and related genera. An analytical key to the genera is also given.

In summarizing the article the author states that alfalfa was brought into Greece by the Persians about 490 B. C., and that it was known to the Greeks and Romans as "Medike" and "Herba Medica" on account of its supposed Median origin. It is thought probable that the name lucern is derived from the name of the valley of the Luzerne river in northern Italy. The name alfalfa is derived from the Arabian "alfacfacah," meaning the best kind of fodder. The prevalent botanical name, *Medicago sativa*, is considered as being improperly used because the name Medicago belongs to another plant not congeneric with alfalfa and generally known as *Trigonella radiata*. It is stated that the correct botanical name of alfalfa is *Medica sativa*.

Alopecurus agrestis, C. FRUWIRTH (*Arb. Deut. Landw. Gesell., 1908, No. 136, pp. 20, pls. 6, figs. 2*).—The botanical characters of this grass are described and its growth, distribution, prevention, requirements, and uses are discussed.

The period of plant food assimilation and dry matter production in the bush bean under different fertilizer and weather conditions, F. FEST (*Jour. Landw., 56 (1908), No. 1, pp. 1–47, fig. 1, dgms. 6*).—The results of the experiments here reported showed that when phosphoric acid was supplied in excess the potash content was influenced only in the first half of the vegetative period and no other plant food elements were affected. An inadequate supply of potash decreased the percentage of potash and increased the percentage of lime. During the early period of growth a lack of potash increased the percentage of nitrogen, but seemed to have no important effect on the phosphoric acid content. A lack of nitrogen manifested itself during early growth through a decrease in the nitrogen and potash content and an increase in the lime content, while the phosphoric acid content was not modified to any important extent. The percentage content of lime was inversely proportional to the percentage potash content of the plant.

A heavy application of phosphoric acid on the plat receiving a complete fertilizer increased the absolute quantities of dry matter and plant food in the first half of the vegetative period and decreased the same toward the close of the growing period. The lack of potash resulted in a marked decrease in the absolute quantities of dry matter, nitrogen, phosphoric acid, and especially in potash. The quantities of lime, on the other hand, were increased during early growth when there was a lack of lime in the soil, but during the ripening period a reduction took place and the quantity of lime in the crop on this plat was smaller at this time than in the plants on the plat receiving the complete fertilizer. An insufficient supply of nitrogen depressed in nearly all cases the absolute quantities of dry matter, nitrogen, lime, potash, and phosphoric acid.

In studying the influence of weather conditions it was found that the weather had a modifying effect on dry matter production and also to a certain degree on the use the plant made of nitrogen. No definite results with reference to potash, lime, and phosphoric acid in this connection are reported.

The results further indicate that in the early stages of growth, before the root nodules have become active, a small application of nitrogen in a readily soluble form would be very beneficial. Lime and phosphoric acid are needed during the early stage and especially when the plant blooms and forms its fruit. Potash is needed during the entire period of growth. It is stated that the bush bean is adapted to the use of plant food supplied in barnyard manure and that it is capable of using phosphoric acid given in slowly soluble form.

Clover growing on the loess and till soils of southern Iowa, W. H. Stevenson and E. B. Watson (*Iowa Sta. Bul. 98, pp. 44–66, figs. 9*).—Pot culture and field experiments are reported, with suggestions regarding the growing of clover in southern Iowa.

In the pot culture tests 1 gal. pots were filled with soil and the effects of manure and lime were studied. In the pot receiving manure at the rate of 16 tons per acre the weight of the crop was 45.9 gm., as compared with 8.8 gm. from the untreated pot, the number of plants being 13 in each case. It was found that lime was not beneficial on the soil used in the test, for a pot treated with lime at the rate of 1 ton per acre showed little or no advantage over the check test.

The field investigations had reference to the effects of a nurse crop, manure, lime, fertilizing material, time of seeding, and character of soil. Lime was applied as finely ground limestone at the rate of 1,000 lbs. per acre, phosphorus as steamed bone meal at the rate of 200 lbs., and nitrogen as dried blood at the rate of 800 lbs. Mixed barnyard manure was used at the rate of 8 tons per acre. Red clover was seeded at the rate of 8 lbs., alsike clover at the rate of 6 lbs., and oats at the rate of 2 bu. per acre.

Clover when grown alone produced a yield from 2 to 4 times as great as when grown with oats as a nurse crop. The plat seeded April 25 produced the heaviest crop, but all were very satisfactory. Manure was decidedly beneficial, in one case the crop being increased from 2,800 lbs. to 5,120 lbs. per acre. The use of phosphorus gave nearly double the yield, while with potash the crop did not increase either when it was applied alone or in combination with phosphorus. With nitrogen, there was an increase of 1,800 lbs. of clover hay per acre over a plat grown with the minerals without dried blood. It is advised, however, that nitrogen should not be purchased in commercial fertilizing materials but should be supplied in barnyard manure or in green manures.

It was further shown that there is practically no difference in the relation of loess and till soils of southern Iowa to the production of red clover. It was observed that clover seed may be carried to the field by manure in such quantities as to improve the stand. While alsike clover was found well adapted to

the soils under investigation it produced only approximately one-half as much hay as red clover.

The flax plant; its cultivation for seed and fiber, W. SAUNDERS (*Canada Cent. Expt. Farm Bul. 59, pp. 5–13*).—This bulletin contains a general discussion of flax culture under Canadian conditions. Particulars relating to the production of dressed flax as well as the production of flaxseed in Canada are given, and some of the results with flax at the different Canadian experiment stations are reviewed.

Millet, C. G. WILLIAMS (*Ohio Sta. Circ. 81, pp. 6*).—The uses of millet and the culture of the crop are briefly discussed and the different varieties, grouped under foxtail millets (*Chætochloa italica*), broom-corn millets (*Panicum miliaceum*), and the barnyard millets (*P. crus-galli*), are described. In addition, Pearl millet (*Pennisetum spicatum*) and teosinte (*Euchlæna mexicana*) are noted.

The deterioration of Red Texas oats in Kansas, H. F. ROBERTS and G. F. FREEMAN (*Kansas Sta. Bul. 153, pp. 147–164, figs. 5*).—Investigations were made to determine why Red Texas oats growing for 2 or 3 years in Kansas give way to a variety having black chaff. The seed of the Red oats as brought from Texas is always mixed with the black variety, but in that State the black oats does not become preponderant.

A study of the varieties shows them to be distinct. The red variety is low and spreading, tends to stool, and has narrower leaves than the black oats, which is upright, broad leaved, and tillers but little. In nursery plats the red oats averaged 8.6 culms and the black 7 culms per plant. The average number of heads per plant was 4 and 2.6 for the red and black oats respectively, or a superiority of 54 per cent in favor of the red. In average number of spikelets per head the black oats showed a superiority of 83 per cent, in the average number of heads per plant of 19 per cent, in the average weight of each spikelet 20 per cent, and in the average total weight of spikelet per plant a superiority of 43 per cent.

In mixtures of the 2 varieties containing 25, 50, and 75 per cent of red oats grown under usual field conditions, the black oats was superior by 6 per cent in the number of bearing heads and by 8 per cent in the weight of the grains. The black oats showed an increase in every case. Pure lots grown in 40 alternate rows and sown in the way usual in the field yielded at the rate of 1,740 lbs. of straw and 19.4 bu. of grain for the red and 3,000 lbs. of straw and 47 bu. of grain for the black variety. Close-pollinated plants of each sort yielded seed which came true.

While these results show that the black oats are apparently better yielders than the red, it is stated that in practice the Red Texas variety is superior in quality and yield and that this is largely due to the shattering in the black variety. It is concluded that the black oats is an admixture in the imported seed, that it does not originate from the red variety, and that pure-bred red oats free from the black seed can be grown.

Canadian field pea, A. ATKINSON (*Montana Sta. Bul. 68, pp. 83–90, pls. 3*).—Directions for growing Canadian field peas are given and the different uses of the crop are explained. According to the reports of farmers who have grown the crop in Montana on a large scale yields of 29 bu. of seed per acre have been secured.

Cooperative potato experiments for 1908, W. J. GREEN and L. H. GODDARD (*Ohio Sta. Circ. 77, pp. 3*).—Brief outlines of different experiments with potatoes proposed for cooperative work with the station are given, together with a blank to make application for taking part in the work.

Rice book (*Kansas City, Mo. [1908], pp. 32, figs. 16*).—This is a popular treatise in rice culture in the coast counties of Texas and Louisiana. In addition to a general discussion of the subject, the location of a number of rice canals and rice mills is given.

The importance of sodium to the sugar beet, K. ANDRLÍK and J. URBAN (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 4, pp. 208–216*).—The results of experiments are presented in tables and briefly discussed.

It was observed that the greater the quantity of potash and nitrogen as compared with the quantity of sodium in the soil, all substances acting simultaneously, the higher the sugar content of the beet. When the quantity of sodium was increased with reference to the other two substances the sugar content was reduced. During the early development of the plant larger quantities of sodium than of potash were present, but after 106 days of growth the quantities of the two substances were about equal, while later and until harvest the quantity of potash continued to increase and was higher than the quantity of sodium. It is stated that in general the more sodium taken up by the beet plant the lower was the sugar content of its root.

The quantity of proteid substance produced in the sugar beet during the first year of its growth, K. ANDRLÍK (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 5, pp. 255–262*).—The investigations reported show that the beet plant produced per hectare in dry years from 420 to 700 kg. of proteid substance, the average being 610 kg., and in years with sufficient rainfall from 650 to 900 kg., or an average of 790 kg. Heavy applications of a nitrogenous fertilizer increased the production of proteids to from 800 to 900 kg., and an application of 1,000 to 1,100 kg. per hectare of nitrate of soda showed a proteid production of 900 to 1,040 kg. per hectare. A heavy yield of beets contained from 70 to 74 per cent of the proteids in the leaves, and a lower yield only from 50 to 60 per cent. In general all conditions tending to increase the yield of leaves favored a high production of proteid substances. To obtain a high yield of proteids requires heavy applications of nitrogenous fertilizers.

No relation was apparent between the quantity of total proteid substance produced and the sugar content of the root. In these experiments the proportion of sugar varied from 4.1 to 13.2 parts to 1 part of proteid substances.

Further studies on sugar-beet plants more than one year old, F. STROHMER, H. BRIEM, and A. STIFT (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Indus. Österr.-Ungar., No. 194, pp. 15*).—The investigations indicated that the cane-sugar content of the sugar beet in its second or third year, when it is desired that further growth shall be made, must not fall below 5 per cent, but that while a definite quantity of sugar in the beet is necessary to induce growth for further seed production the yield of seed is in no way connected with the sugar content, but is rather the result of the number and the life energy of the healthy cells of the root.

The changes in the composition of the root during growth were along the same line, whether the beet was 1 or 2 years old. The 1-year-old mother beets produced much larger quantities of dry matter than was secured from the 2-year-old mother beets. It was further observed that the quantities of nitrogen, phosphoric acid, and potash in the roots of 1 and 2 year old mother beets were insufficient for the production of new organic substance, and that for this purpose applications of these plant-food elements must be made. Both kinds of beets require larger quantities of nitrogen than of potash, and of potash larger quantities than of phosphoric acid. The quantity of plant food required to produce 100 gm. of additional dry matter in the beet was practically the same for 1 and 2 year old mother beets.

Annual sugar beets, M. Deutsch (*Atti 6. Cong. Internaz. Chim. Appl., 3 (1906), pp. 591–601*).—A paper and discussion are presented on the subject of seed production in sugar beets during the first year of their growth.

After reviewing experiments along this line, together with his own experiences, the author concludes that the beet is a biennial when conditions do not prevent it. It becomes an annual after a cessation of growth caused by cold weather, a prolonged drought, or other unfavorable conditions which may escape our observations. Vigorous plants not only resist this tendency of producing seed the first year better than weaker individuals, but they also are less likely to be attacked by the different beet diseases. The author attributes the phenomenon in a general way to the individuality of the beet, stating that the vigorous plants are resistant while feeble plants are not, and that seed production during the first year is regarded as lack of vigor in the individual.

Growing sugar-beet seed in South Dakota, J. H. Shepard (*South Dakota Sta. Bul. 106, pp. 320–349, figs. 8*).—Experiments in growing sugar-beet seed in cooperation with this Department are reported. Cultural and climatic notes are given, the selection of mother beets is described, and the station work with sugar beets in previous years is briefly reviewed.

Owing to a late spring the beets were planted from May 11 to 17, cultivation was given from June 1 to August 13, and thinning was done from July 2 to 8. The first killing frost on September 27 did little damage to the best varieties, but some of the tenderer sorts and some of the stock beets showed the effect of frost very plainly. The beets were harvested October 14 to 23.

No sugar beet with less than 14 per cent of sugar was saved. The data given in tables show that the best strain was Kleinwanzleben Pioneer, which ranged in sugar content in the beet from 14.2 to 24.8 per cent, with an average of 17.9 per cent. Of the 30 beets analyzed of this variety 13 contained over 18 per cent.

Seedling canes and manurial experiments at Barbados 1905–1907, J. P. d'Albuquerque and J. R. Bovell (*Imp. Dept. Agr. West. Indies Pamphlet 49, pp. 119*).—The manurial experiments were carried on at Dodds botanic station and at five sugar estates situated in typical parts of the island. Five of the stations were on black soils and one on red. The weather conditions were not very favorable and in many instances the average weight of canes per acre was small, especially among the rattoon canes. The root disease was also prevalent and was probably the cause of many of the low yields of canes among the rattoons.

This season on the estates selected variety B 3696 gave the best results on the black soils, with a yield of 2,045 lbs. of sucrose per acre in excess of that given by White Transparent, the standard variety, while B 208 stood next with an increase of 1,494 lbs. These yields represent increased values of $29.61 and $21.63 per acre, respectively. B 147 came third and showed an increased value of $13.34 per acre. On the red soils as plants and rattoons B 1566 again gave the best results, producing 8,394 lbs. of sucrose per acre as plants and 6,645 lbs. as rattoons against 6,006 lbs. per acre from White Transparent as plants and 5,736 lbs. as rattoons, representing a total gain of $47.73. B 3635, D 95, B 1753, B 376, and B 1529 gave good results on black soils, and D 95, B 376, and B 208 on red soils.

The average results of the best varieties for the last 4 years show that on black soils B 3696, B 1753, B 1529, and B 147 gave the best returns as plants, the increases per acre being valued at $34.52, $31.71, $16.18, and $11.64, respectively, as compared with White Transparent. Taking plants and rattoons together, B 208 produced on an average 5,542 lbs. of sucrose per acre as against 5,197 lbs. by White Transparent. On red soils as plant canes B 3405 gave the

best results, and B 3412, B 3390, B 1566, B 208, B 1529, and B 376 gave returns far in excess of those of White Transparent. Taking plants and rattoons together, B 376, D 95, and B 208 gave increased values per acre of $10.84, $10.59, and $8.13, respectively, as compared with the standard variety.

As in previous years the fertilizer experiments showed that large and profitable increases are obtained by the addition of commercial fertilizers supplying nitrogen to the ordinary application of barnyard manure, and that ordinary applications of barnyard manure together with commercial fertilizers gave better results than large quantities of barnyard manure without commercial fertilizers. The use of phosphatic and potassic manures resulted in considerable variation of yield, but in some instances notable increases were obtained.

In 1905, 4,874 seedling canes were planted and of these 118 varieties were selected for replanting at the close of 1907. At the end of 1906, 219 seedlings were obtained, which are now under observation. Five canes produced by artificial hybridization are under experimental cultivation.

Experiments in growing tobacco under shade on the east coast of Sumatra, F. W. T. Hunger (*Meded. Dept. Landb. [Java], 1907, No. 3, pp. 112, pls. 3*).—The shade culture of tobacco in the United States is reviewed, statistics on the importation of Sumatra tobacco into the United States are given, and the results of shade culture experiments in Deli in 1903 are reported. In these experiments it was observed that the leaves of all the different types were much lighter in weight when grown under shade than when grown in the open, that shade culture increased the proportion of the higher grade of leaf and also produced a tobacco much lighter in color than that obtained in the check test, and that the length of the leaves produced in the open was more satisfactory than that of the shade-grown leaves.

When the leaves of the tobacco in the check experiments were taken from the plants at noon no light colored tobacco was produced. Harvesting the shade-grown leaves at noon resulted in the same color of the tobacco as harvesting the open-grown leaves in the morning. These results are considered as affirming the conclusion of Mohr, that under ordinary conditions taking the leaves from the plants in the morning gives a larger percentage of high-grade material than harvesting at noon.

The meteorological observations made in connection with this work are discussed, and the data relating to sunshine, air and soil temperatures, rainfall, and relative humidity are recorded in tables. The average air temperature during the day under the tents was higher and the maximum temperature was lower than in the open. The minimum temperature recorded nights was higher under the tent and the temperature of the covered soil was at all times lower than on the check plats. The relative humidity of the air under the tents was higher than in the open, but the rainfall reaching the covered soil was much less than the rainfall on the unprotected plats.

The prophylaxis of shade growing against mosaic disease of tobacco is discussed, and it is believed that shade growing reduces the prevalence of this malady.

In a general discussion of the results, the author points out that shade growing increases the cost of production 100 per cent under the conditions under which these experiments were made.

The art of seed selection and breeding, A. D. Shamel (*U. S. Dept. Agr. Yearbook 1907, pp. 221–236, pls. 5*).—This article treats of the art of seed selection and breeding as the practical application of methods of breeding to the production of improved varieties of plants for commercial agricultural purposes, and the science of breeding as meaning the work of the investigator in determining by means of experiments the principles relating to the different

problems of breeding. Fields of work for the breeder's art are pointed out and examples of results secured are cited. The work of tobacco breeding in the Connecticut Valley (E. S. R., 18, p. 1042) and of securing by selection a hardy variety of hairy vetch for that region is noted. A brief description of the origin of Whelchel dent corn is given to illustrate the use of crossing in securing an improved variety.

The character and qualifications of the plant breeder and his method of work are discussed, and as illustrations the history of Reid Yellow Dent corn, Triumph cotton, and White Burley tobacco is briefly presented.

Improvement of grasses and other forage crops, B. T. GALLOWAY (*U. S. Dept. Agr. Yearbook 1907, pp. 145–148, pls. 2*).—The work here reported in breeding grasses and other forage crops was begun by the Bureau of Plant Industry of this Department 4 or 5 years ago, and embodies some of the results secured.

As the result of crosses between Kentucky blue grass and Texas blue grass 10 distinct types, 8 of which have rhizomes and all of which are taller than Kentucky blue grass, have been secured. In some the leaves are broader, in others narrower than in Texas blue grass, and the hairy processes which prevent the seed of this grass from being sown broadcast are lessened 75 per cent.

A promising hybrid between a clover from Prince Edward Island and the European zigzag clover (*Trifolium medium*) produces large root stocks and appears perfectly hardy at Washington, D. C. A cross between Peruvian and Turkestan alfalfa, designated as No. 15, has a dark stem, medium-sized leaves, and furnishes a large amount of forage. It is also a good seed producer and is apparently hardy near Washington. A number of crosses between varieties of cowpea have been secured. The cross between the Indian and the Unknown variety excelled all varieties grown in length of vine. About 10 per cent of the seedlings grown came into bearing early and these were upright in growth. It is stated that in many cowpea hybrids the seed was not changed in color in the first, second, and third generations. The Whippoorwill-Iron and Red Ripper-Iron crosses, however, split up into 12 very dissimilar sets of peas in the third generation. The Whippoorwill and Iron crosses are satisfactory at present in earliness and seed production, but so far only a small proportion is of the bushy habit of growth.

Improvement of cereals, A. J. PERKINS and W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 11 (1908), No. 6, pp. 540–568, figs. 8*).—This article is a discussion of the work in the improvement of cereals carried on at the Roseworthy Agricultural College. The different varieties of wheat and barley obtained by selection and crossing are described, and the crosses effected in 1907 are enumerated.

Modifications in cereal crops induced by changes in their environment, T. L. LYON (*Proc. Soc. Prom. Agr. Sci., 28 (1907), p. 144–163*).—In discussing this subject this paper reviews some of the experiment station work in this country, furnishing data with reference to whether or not plants adapt themselves to change of climatic or soil influences during the life of an individual and to what extent, if any, this is operative in producing new strains, varieties, or even species.

The germination of vegetable seeds, E. BROWN and W. L. GOSS (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 131, pp. 5–10*).—During the spring of 1907, 2,778 packets of so-called "commission" vegetable seeds were purchased in Maine, Vermont, Massachusetts, Kentucky, Wisconsin, North Dakota, Kansas, and Colorado. These were put up by 27 seedsmen and included seeds of 26 kinds of vegetables. The average germination was found to be 62.2 per cent. The average germination of seeds from one firm was only 37.3 per cent, and from another 44.3 per cent. The variation of germination of different packets of the

same kind of seed from the same firm was in several cases more than 90 per cent. By 21 of the 27 seedsmen represented 200 lots of seed were put up which germinated 10 per cent or less, and by 13 packeting houses 62 lots were put up which entirely failed to germinate. The average germination of the "commission" seeds tested was 25.7 per cent lower than that of the seeds sent out in the Congressional distribution during the past 6 years.

The effect of animal digestion and fermentation of manures on the vitality of seeds, E. I. OSWALD (*Maryland Sta. Bul. 128, pp. 265–291, figs. 3*).—The seeds of 52 species of weeds were placed in piles of horse manure, cow manure, and of horse and cow manure mixed in equal quantities and allowed to remain for 6 months. During the first 60 days the lowest temperature recorded in the piles was 40° F., and the highest 201°, 168°, and 188°, and the average temperature 134°, 120°, and 122° for the horse, cow, and mixed manure, respectively. After 60 days the heat had all passed off and no further readings were taken. At the end of the 6 months, when the buried seeds were sown on sterilized soil, no growth was obtained.

In other tests the seeds were left in the manure for only a month. No seeds germinated after this treatment, but some seeds of rib grass (*Plantago lanceolata*), horse nettle (*Solanum carolinense*), common plantain (*P. major*), large ragweed (*Ambrosia trifida*), bitter dock (*Rumex obtusifolius*), and mallow (*Malva rotundifolia*) were found still hard and firm.

For the purpose of studying the effect of animal digestion on weed seeds 3 healthy yearling calves were fed seeds from a large number of common weeds, and in the germination test in the greenhouse after the seeds had passed through the animals the conditions usually existing when top-dressing with fresh manure, plowing under fresh manure, and pasturing cattle on fields is practiced were approximated. Of the seeds in the manure used as a top-dressing 12.8 per cent, of those in the manure turned under 2.3 per cent, and of those in the manure left as it is found in pastures 3.1 per cent grew. The seeds giving the greatest germination were those of crab grass, Jamestown weed, ragweed, and horse nettle.

HORTICULTURE.

Manuring and fertilizing truck crops, C. P. CLOSE and T. H. WHITE (*Maryland Sta. Bul. 126, pp. 219–242, figs. 4*).—This bulletin contains the results of several manuring and fertilizing experiments with truck crops in which it was sought to bring out the relative values of stable manure and commercial fertilizer, plowing under commercial fertilizer as compared with using it as a top-dressing harrowed into the soil just before planting the crop, heavy and light applications of commercial fertilizers and of fresh and rotted stable manures, rotted manure turned and unturned while in the compost heap, commercial fertilizers derived entirely from mineral sources and those derived entirely from animal and vegetable sources, and the use of stable manure as compared with commercial fertilizer for sweet potatoes.

The tests were conducted on four series of plats. Series D was started in 1899, and series A, B, and C in 1902, 1903, and 1904, respectively. The manures and commercial fertilizers were used in connection with green crops turned under. As near as possible, the same amount of actual plant food was supplied in the chemical fertilizer as was found in the stable manure. A detailed account is given of the work conducted on each series. The results which are tabulated and discussed under their separate headings, are briefly summarized as follows:

"Stable manures always increased the yields, but valued at $2 per ton did not give as much profit as commercial fertilizer.

"Fresh manure spread in winter did not give as much increase as the same amount rotted and plowed down at same date in the spring.

"Turning the manure while rotting was better than leaving it without being turned.

"Commercial fertilizers plowed under in the spring invariably gave larger yields than when sowed on the surface just before planting in the summer.

"About 750 lbs. of commercial fertilizers seemed to be more profitable than three times that amount.

"Continuous crops of sweet potatoes on same land does not appear to be bad practice.

"The quality of the crops, cabbage and potatoes especially, grown upon the check plats, was of very poor grade.

"The soil on plats heavily dressed with mineral fertilizers does not seem to have been changed or injured any more than where the organic fertilizers were applied.

"The seasons through which this work has been followed have all been very moist and some were quite wet."

In the work with sweet potatoes, commercial fertilizer gave the best results for the first three years. The results as a whole, however, appear to favor the use of a combination of stable manure and commercial fertilizer. The smaller quantity of stable manure (5 tons per acre) produced almost as large a crop and gave much greater profits than larger applications of manure.

Truck farming in the Atlantic Coast States, L. C. Corbett (*U. S. Dept. Agr. Yearbook 1907, pp. 425–434, pls. 3*).—The writer points out that the development and extension of truck farming in the Atlantic Coast States has been coincident with the development of transportation facilities throughout that section and briefly discusses the essential differences existing between the methods of growing certain standard crops in various portions of the area. The crops discussed include lettuce, cucumbers, cabbage, potatoes, celery, onions, beans, asparagus, tomatoes, and peas.

Chile culture, F. Garcia (*New Mexico Sta. Bul. 67, pp. 4–32, figs. 10*).—This bulletin contains popular instructions for growing and harvesting chile, including notes on diseases and insect pests. Tabular data are also given on the following chile experiments conducted at the station: Ridge *v.* level culture with field-sown seed, field-sown seed *v.* transplanted plants from seed started in cold frames; yield and cost of production of green and red chile, and the effects of sodium nitrate upon the yield. The results, however, are considered only tentative as the investigations have not been conducted long enough to arrive at definite conclusions.

[Variety tests at Wisley, 1906–7] (*Jour. Roy. Hort. Soc. [London], 33 (1908), No. 1, pp. 184–315*).—Cultural and descriptive notes are given of a large number of varieties of asters, cannas, dahlias, tulips, melons, strawberries, French beans, kales, onions, potatoes, tomatoes, and miscellaneous flowers grown at Wisley during the seasons of 1906 and 1907, together with brief notes on tests of fertilizers, insecticides, implements, etc.

Report of the government horticultural experimental fields in South Holland for 1907, C. H. Claassen et al. (*Verslag Rijkstuinbouwproefvelden Zuid-Holland, 1907, pp. 156*).—This pamphlet embraces the reports from over 150 cooperative cultural, variety, fertilizer, and spraying experiments with a large variety of fruits and vegetables conducted at various localities in South Holland in 1907, under the direction of the professor of horticulture at Boskoop.

Experimental fruit stations of the Province of Quebec, A. Dupuis et al. (*Rpt. Min. Agr. Prov. Quebec, 1907, pp. 139–167*).—Brief reports on orchard and small fruits being grown at nine fruit testing stations in Quebec. A variety

list of fruits which resist the climate and yield good crops, based on the reports of the pomological society of the Province of Quebec and of the horticultural societies, and on the tests of the fruit stations, is also given.

Miscellaneous greenhouse notes, C. P. Close, T. H. White, and W. R. Ballard (*Maryland Sta. Bul. 127, pp. 243–263, figs. 4*).—The results are given of greenhouse investigations which have been conducted during the past 8 years.

In continuation of previous work with fertilizers in solution on chrysanthemums (E. S. R., 14, p. 38), in which cow urine supplemented with phosphates gave good results, tests for 5 years were made of chemical fertilizers in solution containing approximately the amounts of nitrogen, phosphoric acid, and potash found in the urine; muriate of potash, nitrate of soda, and dissolved South Carolina rock being the principal chemical combination used. The urine was used in conjunction with dissolved South Carolina rock. The chemicals gave as good results as, and in some cases slightly better results than, the cow urine. A sheep manure solution was also tried for 3 seasons which appears to have given better results than either of the other mixtures. Lettuce followed the chrysanthemum crop in each case, and the residual fertilizers gave results similar in general to those obtained with the chrysanthemums.

Rye and cowpeas, both alone and combined, and crimson clover were tried as soil formers for greenhouse purposes, the soils on which these were grown being compared with the usual sod and manure compost and white clover sod soil. The test was continued for 5 years, lettuce following chrysanthemums each year, and showed in general that the source of the soil is not a very important consideration for these crops if the soil is properly supplemented with manure or fertilizer. The rye plat soil gave uniformly poorer results than the other cover crop soils tried. From the data secured for several years it also appears that soils enriched with well-rotted manure do not need heavy dressings of phosphate.

Although the necessity of removing greenhouse soils every year or so to avoid disease germs does not appear to be borne out by the work conducted at the station, where one crop of chrysanthemums and two crops of lettuce a year were grown on the same soil for 8 years, it is suggested that the grower who renews his soil annually will probably take the safest course. In a comparison of soil used year after year and of soil annually renewed conducted with carnations for 5 years, the plants on the new soil gave 2 flowers per plant more than those on the continuously used soil.

In an experiment to test the stimulating effect of nitrogen in different forms and amounts, the majority of the plats showed negative results for the 2 seasons tried. On the plats receiving per acre 300 lbs. of nitrate of soda and 500 lbs. of dried blood, respectively, there were more blooms than on the check plat. Dried blood used alone gave the longest stems, while the check plat had the largest flowers.

Tests made relative to the effects of fertilizers upon the stiffness of carnation stems clearly indicate that the use of phosphoric acid gives the stiffest stems, and that potash ranks next. Nitrogen in the form of dried blood gave very weak stems. The plat on which a complete fertilizer was used, however, gave a considerably larger number of flowers per plant and longer stems than any of the other plats, the size of the flowers being as large as the average and larger than those on the phosphoric acid plat.

In a 5 years' test to determine the best time of planting carnations, it appears that of plantings made on July 1, August 1, and September 1, the September planting gave a considerably larger number of blooms per plant. The number of blooms decreased the earlier the planting was made, but the early plantings gave the largest blooms and the longest stems.

The results of tests made of subirrigation *v.* surface watering for lettuce and carnations indicate that any benefit derived from subirrigation does not warrant the extra expense of construction. From the data secured there appears to be no marked difference between tomatoes, carnations, and lettuce grown in solid beds and those grown in benches.

Several ordinary garden varieties of tomatoes were compared with the Lorillard, a commonly used forcing variety. All of the varieties succeeded about equally well under glass, but with some varieties the fruit was too large for the winter trade. Tests were made for 4 seasons of different planting distances for tomatoes. A good average distance apart to set the plants appears to be 1 by 2 ft.

Progress in some of the new work [with vegetables and flowers] of the Bureau of Plant Industry, B. T. Galloway (*U. S. Dept. Agr. Yearbook 1907, pp. 139–145, pls. 3*).—A brief statement of the progress being made in the development of new lettuces and tomatoes for growing under glass and rust-resistant asparagus, and of improvements in lily culture, together with a description of a new summer-blooming dahlia, a hybrid form developed by G. W. Oliver and which has been named the Cosmos.

New hybrid fruits, N. E. Hansen (*South Dakota Sta. Bul. 108, pp. 3–16, figs. 8*).—In this bulletin, a continuation of previous work (E. S. R., 16, pp. 369, 370), brief notes are given on several hybrids resulting from crosses of the native sand cherry (*Prunus besseyi*) and the native plum (*P. americana*) with choicer fruits, including hybrids of the sand cherry with the following plums: Chinese Apricot, Japanese, Sultan, Gold, Bartlett, Climax, native, Persian Purple-leaved, and Pennock Hybrid; the Gold and Red June plums with the sand cherry; and the sand cherry with the peach and the European sweet cherry and apricot. Hybrids are also reported of reciprocal crosses between the native and European plum; *Prunus simoni* with the native plum, and the native plum with the Japanese plum and Chinese Apricot plum. Cuts are given of some of these hybrids, of which the more important are the Hanska and Tokeya, crosses of the native plum with the Chinese Apricot plum and of the native sand cherry with the Chinese Apricot plum, respectively.

The improvement of the native sand cherry by selection from many thousand seedlings is still in progress, and the fourth generation is about to fruit. Several of the third generation, which are an inch in diameter and of good quality, have been sent out for preliminary trial. Only one has been named, the Sioux.

The breeding work thus far shows that the native sand cherry amalgamates readily in hybridizing with other species, and that excellent results may be hoped for, especially with hybrids of the Japanese plums. It has been demonstrated that it is possible to secure fruits combining the hardiness of native stone fruits and at the same time approaching the size and quality of the choice cultivated stone fruits from Europe and Asia.

Promising new fruits, W. A. Taylor (*U. S. Dept. Agr. Yearbook 1907, pp. 305–320, pls. 8*).—Historical notes and descriptions with colored illustrations are given for several recently introduced or little known fruits and nuts that are considered worthy of testing in various sections of the country, including the Delicious and Ensee apples, Lambert cherry, Miller and Ruby persimmons, King orange, Sandersha mango, and Wolford, President, Sovereign, Kincaid, and Mantura pecans.

A study on the volume-increment of fruits, G. Rivière (*Jour. Soc. Nat. Hort. France, 4. ser., 8 (1907), Dec., pp. 747–750*).—Tabulated data are given, together with the conclusions reached, relative to a study made by the author in conjunction with G. Bailhache on the increase in volume through the growing season of the fruit of several varieties of early, medium, and late season

pears. The measurements were taken by entirely submerging the fruit in a special vase filled to the brim with water, the water thus displaced being caught and measured in a graduated glass.

It is concluded from this study that with pears the volume accretion of the fruit is very irregular and differs greatly among different varieties. The late maturing fruits show a maximum growth development during the periods directly preceding the harvest. Summer pears show the greatest increase in growth during the middle of their season. With autumn fruits the greatest increase was made from a month to 6 weeks before the harvest with some varieties to just previous to the harvest with others.

The orchards of Maine, E. F. HITCHINGS (*Bul. [Maine] Dept. Agr., 7 (1908), No. 1, pp. 39, pls. 2, figs. 6*).—Owing to the severe injury to the orchards in some sections of Maine during the winter of 1906–7, the author was called upon to make an investigation relative to the extent and causes of this damage. The present bulletin contains a report of this investigation, together with suggestions for the cultivation and care of fruit, including methods of controlling insect pests and fungus diseases. In all, 950 orchards were inspected with a total of 443,184 trees, of which number 24,613 were killed outright, and it is estimated that about the same number were injured more or less severely.

The orchards investigated included all conditions of location, culture, etc., but where the loss was heavy the conditions were found to be the same. The ground was but slightly frozen, a covering of snow prevented further freezing, and the cells in the cambium layer were destroyed by the sap or moisture being withdrawn quickly by a sudden freeze after the warm weather.

Survey and outlook of the fruit interests of the State (*Wyo. Bd. Hort. Spec. Bul., 1 (1907), No. 1, pp. 32, pl. 1, figs. 12*).—This bulletin contains a general survey of horticultural operations in Wyoming during 1907, including consideration of the operation of the horticultural law, the establishment of home nurseries, nursery and orchard inspection work, the record of the organization of the State horticultural society, and addresses on the future of horticulture in the State of Wyoming by J. M. Carey and on wind-breaks by W. W. Wolfe. The text is accompanied with illustrations of different varieties of apples grown in the State.

The status of the American lemon industry, G. H. POWELL (*U. S. Dept. Agr. Yearbook 1907, pp. 343–360, pls. 5, figs. 2*).—An account of lemon culture in California relative to its history and present development, methods of culture, protection against frost, insect and fungus troubles, and the cost of maintaining a lemon grove. The various phases of handling the crop are also discussed, including picking, washing, coloring, curing and storing. Tabular data are given showing the imports of lemons in the United States for the fiscal years 1900 to 1907 and shipments of lemons from southern California from 1897 to 1907. The annual import of lemons, mostly from Sicily, is given as about 150,000,000 lbs. The annual production in California approximates 100,000,000 lbs. As a result of the recent progress in the industry the demand for the best brands of California lemons is greater than the present supply.

Strawberries for New Hampshire, H. F. HALL (*New Hampshire Sta. Bul. 137, pp. 159–188, figs. 32*).—This bulletin was prepared for the benefit of the amateur as well as the commercial grower. Part one deals with the various cultural phases, including selection and preparation of soil, fertilizing, planting, varieties, cultivation, training, irrigating, mulching, harvesting, selling, renewal of old beds, and the estimated cost of production. Part two consists of descriptive notes, with illustrations in many cases, of varieties tested on the college grounds.

The tabular results are given of a test made to determine the relative value between thick and thin spacing. Plants standing 6 ins. apart in wide matted rows gave the greatest average yield of number one berries. A 2½ ft. wide matted row with alleys 18 to 20 ins. is believed to be the best method for commercial growers to adopt.

A study on the quality and production of several red varieties of grapes, H. Faes and F. Porchet (*Chron. Agr. Vaud, 21 (1908), No. 6, pp. 131–139*).—Tabulated data relative to a test of several varieties of red and white grapes are reported for the years 1902, 1905, 1906, and 1907, circumstances preventing the collection of similar data for 1903 and 1904. The data show the average fruit production and sugar content in grams per plant, as well as the average percentage of sugar and acid in the must of each variety. The different varieties are discussed and one red variety, the Limberger, is especially recommended for the region of Vaud on account of its great resistance to rot and its satisfactory sugar content.

A study relative to the accumulation of sugar and the decrease of acidity in the fruit of Chasselas Doré grape, G. Rivière and G. Bailhache (*Jour. Soc. Nat. Hort. France, 4. ser., 9 (1908), Feb., pp. 125–127*).—In continuation of previous investigations by the authors (E. S. R., 19, p. 844), the progressive accumulation of sugar and the decrease of acidity in the berries from their formation to the period of maturity was traced with fruit growing on both ringed and unringed shoots. Two bunches of grapes were grown to a shoot, and analyses were made on August 5 and 10, September 5 and 19, and October 10 and 22. The effect of ringing the shoots was noticeable in the early stages of growth by both the greater increase in sugar content and decrease in acidity.

Forcing plants with electricity, H. Bos (*Umschau, 12 (1908), No. 12, pp. 228–232, figs. 3*).—An account, including a description of the apparatus used and the results obtained, is given of experiments conducted by the author in forcing flowering shrubs and bulbs with electricity. The operation consisted in passing a weak current through the plants. In most cases the bulbs were seriously damaged by this operation, no positive results being secured. With some of the shrubs a weak current passing through the plant appeared to shorten the resting period of the plant and force it into bloom. In some cases this development appeared to take place in those branches through which the current did not directly flow. The experiments are not considered extensive enough to warrant any definite conclusion as to the value of this method of forcing plants.

Roses; their history, development, and cultivation, J. H. Pemberton (*London and New York, 1908, pp. XXIV+336, pls. 11, figs. 32*).—In part 1 of this popular work consideration is given to the botany of the rose and to descriptions, including notes on the history and development of British wild roses, wild roses of other countries, and summer and autumn flowering roses. Part 2 is devoted to rose cultivation, including the soil and its treatment, manures, planting, pruning, budding, and methods of propagation, together with chapters on the culture of roses for exhibition purposes, exhibiting, judging, growing roses under glass, and insect pests and fungus diseases. A descriptive list is given of selected roses recommended for cultivation, together with the method of pruning each type.

The bibliography of the chrysanthemum, C. H. Payne (*Jour. Soc. Nat. Hort. France, 4. ser., 8 (1907), Dec., pp. 738–747*).—This bibliography is believed to be the most complete on this subject, and includes over 140 general treatises and society publications of various countries, dealing with the history, culture, and classification of the chrysanthemum.

Yard and garden, T. Baker (*Indianapolis, Ind., [1908]*, *pp. 418, pl. 1, figs. 132*).—This popular work is offered as a book of practical information for the amateur gardener in city, town, or suburb. Consideration is given to the planning and treatment of the home grounds, the use and culture of vines, annuals, perennials, bulbous and tuberous rooted plants, shrubs, and trees, varieties recommended for different purposes, seasons, and methods of treatment, soil and fertilizers, insects and diseases, and the indoor winter window garden. An appendix contains planting tables of bulbous plants and annuals for various purposes, together with diagrams illustrating different forms of planting.

FORESTRY.

Report of board of directors of the American Forestry Association for the year 1907 (*Forestry and Irrig., 14 (1908), No. 3, pp. 153–162, figs. 2*).—This report, presented at the last annual meeting of the association, contains a summary of the work of the association for the year, together with an outline of the forest situation and of forestry work in the various States. The advancement in educational work in forestry at different universities and schools is also reviewed, together with instances of increased interest in tree planting and forest conservation on the part of cities, business concerns, and individuals.

Report of the forestry branch for the period July 1, 1906, to June 30, 1907, R. Dalrymple-Hay (*Rpt. Forestry Branch N. S. Wales, 1907, pp. 25, pls. 6*).—This report deals with various forestry operations for the year ending June 30, 1907, including alterations in areas, administrative and sylvicultural work, revenues, expenditures, imports and exports of timber, inspection of timber for export, and general notes on the timber industry.

In a series of appendixes several subjects dealing with forestry in New South Wales are discussed, including forest conservation, the forest survey, a description of state forestry as existing at present, timber supplies of New South Wales and their relation to public works, timber legislation, and the annual report of the government botanist on forestry work for the year. Illustrations are also given of several species of eucalypts.

The causes of timber lines on mountains, C. H. Shaw (*Abs. in Science, n. ser., 27 (1908), No. 687, pp. 339, 340*).—The author describes observations on the timber lines of the White Mountains, Adirondacks, and Selkirk Mountains. In the last-named case it is held that snow, acting as a mechanical agency, plays an important part, either by the direct breaking of the trees under the weight of the snow, or by rendering the small trees and lower branches particularly liable to fungus attacks on account of the late-lying, wet beds of snow.

The author states that when the timber line is restricted by winds, the trees are limited in height and grow thickly in level-topped associations. The upper outposts of the forest are in local depressions or sheltered spots. On the other hand, when the struggle of the trees for existence is with the snow, the forest as altitude increases is resolved into groups of trees. These become more separated and the upper groups occupy ridges and local elevations. The trees injured by the snow possess the spire form, with flourishing upper shoots, but the lower branches and foliage are dying or dead, broken by snow, and attacked by fungi.

Cutting timber on the National Forests and providing for a future supply, R. Zon (*U. S. Dept. Agr. Yearbook 1907, pp. 277–288, pls. 3*).—The author discusses the Government policy of dealing with the timber land on the public domain during three periods as follows: (1) Prior to the act of Congress of June 4, 1897, which gave the Secretary of the Interior authority to sell timber

from the forest reserves; (2) from 1897 to the transfer of these forest reserves to the Forest Service of the Department of Agriculture on February 1, 1905; (3) from 1905 to the present time since the transfer of these forests to the Forest Service. The influence of each of these periods on the condition of the cut-over land and on the kind of forest that such land will produce is discussed and the measures by which the Forest Service aims to establish reproduction on these cut-over areas are briefly stated.

Chestnut oak in the southern Appalachians, H. D. Foster and W. W. Ashe (*U. S. Dept. Agr., Forest Serv. Circ. 135, pp. 5–23*).—This circular deals with the botanical and commercial distribution of the chestnut oak, the extent and character of the present stand, the wood and its uses, sylvical characteristics and requirements, reproduction, susceptibility to injuries and management.

The chestnut oak grows in rocky exposed situations where white oak and other more valuable hardwoods will not thrive, hence aside from its timber value, it is considered important as a protective covering on the steeper slopes. Owing to its sprouting ability and comparatively rapid sprouting growth, it is advised that the chestnut oak be grown as a coppice forest, particularly for the production of ties.

Notes on forest and ornamental trees on the grounds of the Agricultural and Mechanical College of Texas, H. Ness (*Texas Sta. Bul. 105, pp. 3–14, pls. 10*).—The station has grown in its arboretum and on the campus a large number of trees, representing several genera, of which the principal are ash, birch, beech, box elder, catalpa, chestnut, China tree, elm, hackberry, Japan varnish tree, locust, linden, magnolia, maple, mulberry, poplar, sycamore, sweet gum, willow, walnut, arbor vitæ, red cedar, cypress, and pine. Notes are given on the behavior of these various trees under the soil and climatic conditions of that region, together with some general observations on tree growth, transplanting oaks and conifers, and subsequent care.

The greater number of the fast-growing soft-wooded trees, which confine their roots almost exclusively to the surface soil, proved to be failures. Such trees make a continuous, rapid growth under moist conditions in the spring, but this growth is checked by a few weeks of drought before the newly formed tissues have become sufficiently hardened to withstand the strong transpiration, and as a result the leaves fall off prematurely and the extremities of the shoots die in August and September. The hardwood deciduous trees and many of the conifers, which have an intermittent growth, appear to be well adapted to endure in regions with an irregular supply of moisture.

The physical characteristics of the hardwoods of Australia, G. A. Julius (*Perth: Govt., 1907, pp. 6, pls. 21*).—This report, supplementary to the report of some 16,000 tests of Western Australian timber made in 1906 (E. S. R., 19, p. 42), gives results of some 8,800 tests of Eastern Australian hardwoods. The tests were made for cross-bending, end and cross compression and hardness at both 12 per cent moisture and when green, and of direct strength in tension and shearing, being conducted upon the same machinery and in the same manner as those of the previous year. Plates are given representing graphically the strength of the various timbers at all degrees of seasoning, together with comparative data of all the tests conducted during 1905, 1906, and 1907, thus including practically all the commercial hardwoods of Australasia.

In regard to the strength of the hardwoods as compared at 12 per cent moisture, the first 9 species in order of their strength were Yate, Ironbark, Salmon Gum, Tuart, Wandoo, Morrell, York Gum, Grey Box, and Karri. It is pointed out that all of these are native to Western Australia except Ironbark and Grey Box, which were obtained from New South Wales.

The use of wooden poles for overhead power transmission, C. WADE (*Jour. Inst. Elect. Engin. [London], 39 (1907), No. 185, pp. 304–358, pls. 3, figs. 22*).—In this paper, read before the Institution of Electrical Engineers in May, 1907, an account, together with the discussion which followed, is given of experiments dealing with the strength, breaking load, wind pressure, deflection, etc., on single poles and double A-shaped poles. The tests were conducted by the author assisted by Professor Goodman of Leeds University. The methods of procedure are described and illustrated and the tabulated results, together with the method of reducing them, are given in an appendix by Professor Goodman. The discussion which followed is also reported.

In general the results showed the superiority of an A-shaped pole over a single pole for high-tension work, both as regards economy and strength, the "A" pole being shown to be at least four and one-half times as strong as a single pole.

The usual breaking point of a single pole when tested to destruction was about 5 ft. above ground level or about 10 ft. from the butt. Hence, the diameter of the pole at this point is the most important dimension to consider in estimating for certain loads. The weakest point of an "A" pole is at the top, where the stress due to windage and weight takes place. The member of the pole which is under tension tends to elongate and force itself away from the member in compression.

Tests made of different methods of constructing "A" poles are also described. In "A" poles spread to different widths at the bottom, the spread which gives strength combined with cheapness of erection was found to be about 4 ft. on a 32 ft. pole or a taper of about one-eighth.

One advantage of wooden poles in general, as shown by the test, is their great flexibility and recuperative power after severe deflections from the perpendicular caused by abnormal stresses. Some single poles which were projected free for a length of 35 ft. were deflected under pressure from 13 to 15 ft. before breaking, and when released showed a very small permanent set.

Judging from the data secured in these experiments, it is believed that the factor of safety usually required in high-tension work can be greatly reduced.

Treating wood that is refractory to treatment and also subject to decay, D. ALLERTON (*Engin. News, 59 (1908), No. 8, p. 182*).—An abstract of a paper read at the annual meeting of the United States Wood Preservers' Association at Kansas City in January, 1908, and dealing with creosoting experiments with Douglas fir recently conducted for the purpose of deriving a method to secure the maximum penetration of creosote with a specified amount of preservative to the cubic foot.

Three methods were tried in preparing the timber for injection, viz, steaming the timber with dry steam and afterwards applying a vacuum, repeating this method at short intervals, and boiling the timber in creosote. In each case with green timber the excess of water was removed with difficulty, the fiber was injured, and not over 7 lbs. of creosote could be injected to the cubic foot, whereas 10 lbs. per cubic foot is the specified amount for piling. The fiber was also injured when seasoned timber was treated and the same difficulty experienced in injecting the oil.

A method was finally adopted in which seasoned fir is placed in a sealed retort and steam turned into the coil, the creosote being introduced at a temperature of 170° F. A temperature of 175 to 180° is maintained about an hour, when pressure is started gradually in order to allow the injected oil to fill the expanding and heated cells. By gradually increasing the pressure this oil is forced still farther in by the increased pressure of the oil behind. When piling

was treated in this manner a penetration of from 2 to 4½ in. was secured in from 12 to 14 hours. With green fir the open tank method was used, but otherwise the preliminary treatment was the same as for seasoned fir. After 12 hours of pressure, however, the oil was drawn off and the wood and retort cooled for 12 hours, when pressure was again applied for a period of 12 hours. It is found that the most oil is injected in the first 12 hours, but that the greatest penetration takes place in the second 12 hours. The average penetration was from 1 to 2 in. Both processes are said to require skilled help in order to produce satisfactory results.

Preservation of wood against decay from soil, fungus diseases, and insects. E. Henry (*Préservation des Bois contre la Pourriture par le Sol, les Champignons et les Insectes. Paris and Nancy, 1907, pp. 96, pls. 10*).—Noted from another source (E. S. R., 19, p. 441).

The Ceara rubber tree in Hawaii. J. G. Smith and Q. Q. Bradford (*Hawaii Sta. Bul. 16, pp. 7–30, pls. 4*).—An account of the Ceara rubber tree (*Manihot glaziovii*) with special reference to its culture in Hawaii. The tree is discussed relative to its habit of growth, root system, latex system, and seed. Suggestions are given for its culture including seed bed and planting practices, cultivation and subsequent treatment, harvesting and preparing the rubber for market, in which special attention is paid to methods of tapping the tree and coagulating the latex. The bulletin also contains the results of one year's experiments in tapping rubber trees together with a discussion of the future of plantation rubber and notes, by D. L. Van Dine, on the insect enemies of the Ceara rubber in Hawaii.

The tapping experiments were conducted in two small groves of Ceara trees on the island of Kauai. One of these groves was about fourteen years old and the other nine years old. Detailed data are given of the tapping operations in each grove. Tapping experiments thus far indicate that there is a wide variation in the amount and quality of the latex yield by individual trees, hence it is advised that each tree should be tested relative to the quality and quantity of its latex before the tree is two years old and that inferior trees in this respect should be taken up. There appears to be some relation between atmospheric conditions and the flow of latex, although this relation has not thus far been determined. Double the amount of rubber was procured by trickling water containing ammonia over the tapping area over that by tapping without the use of water. For this purpose a water bag holding about a quart of water made with alternating narrow strips of porous oiled cloth or canvas was tied around the tree 6 or 7 ft. above the ground, just above the tapping area. The bag was left on the tree during the whole tapping season. It is believed that the use of water will cheapen the cost of production and will practically do away with the production of scrap or waste rubber. The opinion is advanced that daily tappings for a period of two to four weeks or more will yield much better results than tapping on alternate days or longer intervals over a period of several months. In the present experiments daily tappings for a period of nine days gave better results than tapping on alternate days for double the time, and the recovery of the tree was more rapid. Trees tapped either just before or during the resting period did not leaf out as quickly as trees which had not been tapped.

Relative to planting operations in Hawaii, it is stated that by January, 1908, 400,000 rubber trees had been planted of which upwards of 90 per cent were *M. glaziovii*. The remainder are *Castilloa elastica* and *Hevea brasiliensis* in about equal proportions. It is expected that tapping operations will soon commence on some of these plantations.

The rubber plant of southern Europe, Mattei and G. Van den Kerckhove (*India Rubber World, 37 (1908), No. 6, pp. 177–179, fig. 1, map 1*).—An account, including historical notes, botanical description, geographical distribution, and uses, is given of a gum-yielding species of plant, *Atractylis gummifera*, native to the Mediterranean region both in Europe and Africa. Several analyses were made of this gum and show a rubber content of from 22.96 to 36.46 per cent, with about double that amount of resin. The plant, which appears to have been known from remote times, grows mostly underground in the shape of a large cylindrical trunk, often weighing from 20 to 40 lbs. The leaves grow close to the ground. The Sicilians are said to free the rubber from the resin by chewing the gum. The rubber is then dissolved in spirits of turpentine in order to make a sort of bird lime for catching birds.

Although it is not believed that the gum of Atractylis can take the place of rubber, it is thought that it may be adapted to mixing with it in the same manner as the gums of guayule and pontianak.

Hints on the cultivation of Para rubber, A. W. Bartlett (*Separate from Off. Gaz. [British Guiana], 1907, April 17, pp. 3*).—Brief practical suggestions are given relative to the methods of packing Para seed for shipment, sowing, planting operations and distances, shade and protection from wind, intercrops and catch crops, green manuring, and pruning.

DISEASES OF PLANTS.

Notes on some plant diseases, L. Savastano (*Bol. Arbor. Ital., 4 (1908), No. 1, pp. 21–32*).—Descriptions are given of a number of obscure diseases of citrus trees and fruits, among them a retardation of the growth of orange trees following transplanting, drying of oranges and lemons on the trees, lemon scald, sunburn of the fruit, etc. Notes are also given on vine chlorosis, a disease of alder trees, the biology of the downy mildew of the grape, grape powdery mildew, etc.

Fasciations of known causation, H. Hus (*Amer. Nat., 42 (1908), No. 494, pp. 81–97, figs. 2*).—A description is given of a number of forms of fasciation, the causes of which are grouped under four heads: Mechanical causes, cases where no injury can be traced, the action of fungi, and the action of insects.

Experiments in combating plant diseases, F. K. Ravn and A. Madsen-Mygdal (*Samvirk. Landbofor. Fyens Stift, 1906, pp. 24*).—The report covers experiments on the prevention of smut in spring grains by the hot-water and the formaldehyde methods, studies on barnyard manure as a carrier of contagion of the club-root disease, and experiments on the application of lime as a remedy against the club-root disease. The work along these lines will be continued.

Texas root rot of cotton: Field experiments in 1907, C. L. Shear and G. F. Miles (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 9, pp. 3–7, fig. 1*).—In a previous publication (E. S. R., 19, p. 247) an account is given of the beneficial effect of deep fall plowing and a rotation of crops for the control of the root rot of cotton, due to *Ozonium omnivorum*. In the present publication a more detailed statement is given of further experiments in cultivation and rotation of crops for the control of this disease. It is stated that by rotation with immune crops, a field which in 1904 was planted to cotton with a loss of 95 per cent from the root rot, was, after two seasons with corn and wheat, again planted to cotton in 1907, when the crop was but slightly affected by the root rot. It seems probable that a combination of rotation of crops and deep fall plowing will prove a satisfactory, efficient, and practicable means of control.

Hollow potatoes, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1908, No. 3, pp. 139, 140, fig. 1*).—During the past autumn some diseased potatoes were submitted to Kew for investigation. The potatoes were well grown and externally showed no trace of injury, but when cut open were found to be hollow, only an external shell, varying from a quarter to half an inch in thickness, remaining. In some specimens the cavity was empty, dry, and lined with a shriveled mass, while in other cases the cavity was more or less filled with an unpleasant smelling pulp, which on examination was found to be teeming with nematodes. A series of sections showed that the nematodes gained entrance to the tuber through the original point of attachment to its branch. They then gradually used up the substance of the tuber, working from the center outward until their progress was checked by the vascular zone, which lies at some distance within the potato.

The nematode appears to be *Aphelenchus pyri*, a species originally found in decaying pears. It is believed to be a wound parasite that gains entrance through the minute openings formed by the decay of the tissue at the point where the vascular ring enters the tuber.

Experiments in infecting tubers were carried on, and where the slime described above was placed on the scar formed by the detachment of the tuber, the tubers when cut open after 10 days revealed cavities an inch in diameter. In a second experiment where the nematodes were applied to the eyes of the tubers no infection took place.

On the existence of Myxomonas betæ, F. C. VON FABER (*Ber. Deut. Bot. Gesell., 26a (1908), No. 2, pp. 177–182*).—A careful study has been made of the diseases of beets which, according to Brzezinski, are due to *M. betæ*. The author claims that he was unable to discover any organism resembling in any way that described by Brzezinski, and he concludes that there is no myxomycete associated with these diseases of the beet.

The distribution and control of cucurbit mildew, G. KÖCK and K. KORNAUTH (*Ztschr. Landw. Versuchsw. Osterr., 11 (1908), No. 2, pp. 128–145, pl. 1*).—An attempt has been made to determine the extent to which the cucurbit mildew (*Plasmopara cubensis*) is present in the principal regions of Austria, the relative resistance of varieties, and means for the control of the disease.

The mildew was found quite common in all centers where cucumbers and other cucurbits are extensively grown. Marked differences were noted in the susceptibility of cucumbers, melons, and squashes, cucumbers being much more subject to attack by the fungus, the others seeming to be protected to some extent by their stronger leaf structure.

Experiments were made with about 70 varieties of cucumbers and marked differences in susceptibility to mildew were observed. All the varieties of climbing cucumbers proved quite resistant.

In experiments for the control of the disease, soil sterilization was found worthless, but frequent spraying with a 1 per cent solution of Bordeaux mixture reduced the amount of loss very materially. The addition of potassium permanganate to the Bordeaux mixture was found to be without any particular advantage. Rain and a sudden falling in the temperature were found to favor the rapid spread of the mildew. Where cucumbers are grown under glass, it is recommended that the interior of the house be disinfected with formaldehyde before planting and the plants protected with Bordeaux mixture during the growing season.

Infection experiments with cucurbit mildew, G. M. REED (*Trans. Wis. Acad. Sci., Arts, and Letters, 15 (1907), pt. 2, pp. 527–547*).—Experiments were carried on with the mildew of cucurbits (*Erysiphe cichoraccarum*) to determine

whether this fungus is specialized on particular species or varieties of cucurbitaceous plants.

In the course of the experiments 23 varieties of common cultivated cucurbits were used, which represented 5 different species and 3 genera. Each of the types was readily infected when inoculated with the conidia taken from any other. Young plants were used in all the experiments, and the great susceptibility of young plants to the disease was questioned. In this connection several vines of squashes and ornamental gourds grew to maturity in the greenhouse and the mildew spread over all of them. At first the spread was slow on the gourds, but later they were covered with white patches of mycelium and produced immense quantities of conidia.

As a result of the experiments there appears to be no indication of specialization of this mildew on any genus or species of cucurbits.

The same species of mildew is reported as occurring on golden-rod and asters. The author transferred conidia from squashes to these plants, without causing any infection. This line of investigation is being continued.

A brief bibliography is appended to the article.

The cross-inoculation of fruit trees and shrubs with crown-gall, G. G. Hedgcock (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 131, pp. 21–23*).—An account is given of experiments with apple and pear seedlings, in which the author attempted to determine the susceptibility of these plants to infection by the soft and hard gall forms from other host plants. Three series of experiments have been carried on, involving several thousand seedlings, and as a result of these and other investigations the author has arrived at the following conclusions:

"The soft galls from the almond, apricot, blackberry, cherry, peach, plum, prune, and raspberry have been transferred easily to seedlings of the almond, apricot, peach, and raspberry; less readily to those of the blackberry, cherry, plum, prune, and pear; and with great difficulty to seedlings of the apple, chestnut, walnut, and rose.

"The soft galls of the apple, chestnut, walnut, rose, and pear, as a rule, have not been transferred readily to any of the plants mentioned. Evidence has been obtained of a wide range of susceptibility in different varieties of the same plant. This has been noted in varieties of the apple, blackberry, cherry, chestnut, pear, and rose."

A new cherry disease, E. S. Salmon (*Gard. Chron., 3. ser., 43 (1908), No. 1110, pp. 209, 210, figs. 3*).—During 1907 a fungus disease of cultivated sweet cherries was observed which, according to the author, does not appear to have been hitherto recorded in England.

The general appearance of the affected branches shows the leaves curled and of a pinkish-red color. Soon a delicate whitish bloom becomes visible, spreading over the greater part of the under surface of the leaf. The leaves then turn brown, blacken, and decay. Frequently only a single leaf on a branch shows the disease, in other cases 2 or 3 scattered here and there are affected, while in rare cases most of the leaves on a branch are attacked. In large old trees seldom more than a few branches are attacked, but young trees may become seriously infested.

The disease is due to the fungus *Exoascus minor*. It is said to be closely allied to *E. deformans*, which causes the leaf curl of peaches, etc., and also to *E. cerasi*, the cause of the witches' brooms of cherry.

As the fungus is perennial, the mycelium living from year to year in the buds and young wood, the affected branches should be pruned and destroyed. The pruning should be followed by thorough spraying with Bordeaux mixture.

Severe pruning and spraying as directed, it is said, will completely restore the life of a tree in a single season.

A description is also given of the witches' brooms of cherry, due to *E. cerasi*.

Recent studies of the olive-tubercle organism, E. F. Smith (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 131, pp. 25–43*).—On account of apparent confusion as to the true cause of the disease of olives known as tuberculosis, olive knot, tumor, etc., the author has reviewed the work of a number of investigators and has made studies of material secured from California, Italy, and other countries. He has found that apparently mixed cultures have been used by a number of former experimenters and that the true cause of the olive tuberculosis is a white, nonliquefying bacterium, which is found in the olive tubercle and develops in many culture media as a short rod with rounded ends, occurring singly or in pairs. The yellow organism and others that have been described from time to time as causing the disease are believed to be present saprophytically.

A description is given of the organism, which for nomenclatorial reasons the author calls *Bacterium savastanoi*, together with an account of studies made with it in different media.

The disease is known to occur in Italy, France, Spain, Algeria, Tunis, and California, injuring the olive trees and sometimes destroying them. The organism enters the plants, so far as known, exclusively through wounds. Some varieties of olives seem more subject to the disease than others, and these should be discarded. Skillful pruning, particularly if accompanied by sterilization, will help hold the disease in check, and it is thought probable that the application of some of the better fungicides would aid in its control.

Investigations and trials relating to the appearance of the gooseberry mildew, and measures for its eradication, J. Lind and F. K. Ravn (*Separate from Gart. Tid., 1908, No. 1, pp. 15*).—Spraying with Bordeaux mixture and potassium sulphid solution and dusting with sulphur was found to decrease, but not to prevent entirely, attacks of the fungus disease. The winter treatment recommended consists in (1) pruning the bushes and burning all cut branches and berries, (2) raking together fallen leaves, berries, twigs, etc., and burying them in the ground, and (3) disinfecting the bushes by spraying with acid Bordeaux solution (100 parts water, 8 lbs. copper sulphate, and 1 lb. quicklime or 1½ lbs. slaked lime). This treatment should be followed by spraying with potassium sulphid solution, common Bordeaux mixture, or sulphur every 8 to 10 days from the beginning of May to the beginning of July. The cutting and removal of all diseased branches and berries should be continued throughout the season.

Notes on the treatment of mildew, L. Degrully (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 14, pp. 419–427, pl. 1, fig. 1*).—Attention is called to the necessity of preventive treatments in combating the downy mildew of the grape, and a discussion is given of the quantity of fungicide required in spraying and the relative adhesiveness of different mixtures. Formulas are given for the preparation of about one dozen fungicides.

The black rot of the grape, and its control, D. Reddick and C. S. Wilson (*New York Cornell Sta. Bul. 253, pp. 367–388, figs. 11*).—An account is given of the fungus (*Guignardia bidwellii*) that causes the black rot of grapes, the different stages of the fungus being described in considerable detail.

A report is given of experiments conducted during 1906 and 1907 for the control of the black rot, in which Bordeaux mixture of different strengths, supplemented by treatments with other fungicides, was tested. The experiments in 1907 were undertaken on a considerable scale in a commercial vineyard, and as

a result of the spraying, a net increase of $32.95 per acre was secured. The season was comparatively dry and not favorable to the development of the disease, but from the good results obtained, it seems probable that when the black rot is prevalent to a moderate degree, spraying will completely control it.

A demonstration experiment for the control of black rot was carried on in another region in 1907, in which 4 treatments of Bordeaux mixture and 1 of ammoniacal copper carbonate were applied to the graperines. From the treated rows 1,322 lbs. of grapes were gathered, 97 per cent of which were of commercial grade, while from the unsprayed rows 606 lbs. of grapes were secured, 93 per cent of which were marketable.

On account of the belief that bagging grapes secures considerable protection from rot, a limited experiment was carried on in 2 different vineyards, with results which were decidedly unfavorable to the practice of bagging.

In conclusion, the authors recommend the collection and destruction of all the old mummified grapes, thorough cultivation, the growth of cover crops sown early in July, and spraying with Bordeaux mixture at such intervals as the weather requires.

A disease of chestnut trees, H. Sangier (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 2, pp. 92, 93*).—A brief note is given on a disease of chestnut trees in Portugal that is said to be due to a lack of nitrification in the soil. When this is corrected by drainage and the addition of lime about the trees, the vigor of the trees is restored and the diseased condition disappears. The drainage and application of lime about the trees should be done during their resting period.

The possibility of the control of walnut blight by the use of immune varieties, H. J. Ramsey (*Pacific Rural Press, 75 (1908), Nos. 14, pp. 212, 213; 15, pp. 228, 229*).—Attention is called to the fact that among the walnut orchards of California there are frequently to be found individuals that are more or less resistant to the walnut blight. Some of these have very superior qualities, and the author recommends that they be rapidly propagated by grafting upon resistant stock. A method of grafting that has proved very successful is described.

Diseases of ornamental trees, H. Metcalf (*U. S. Dept. Agr. Yearbook 1907, pp. 483–494, pls. 3, fig. 1*).—A popular account is given of some of the more common diseases to which shade and ornamental trees are subject, with suggestions as to possible means for combating or controlling them. The diseases are grouped into 2 categories, those due to unfavorable surroundings, such as starvation, lack of aeration, gas poisoning, drying and freezing, smoke, dust, etc., and those due to parasitic fungi. As most of the fungi gain entrance through wounds, attention should be paid to these and cut or injured surfaces protected as much as possible.

Rose mildew, E. Prillieux (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 2, p. 94*).—The author calls attention to the rose mildew (*Sphærotheca pannosa*), which is said to be particularly troublesome to the Bengal and hybrid roses. For combating this disease it is recommended that the shoots showing the perithecia of the fungus should be cut off during winter and burned and the remaining portions of the plant sprayed with lysol or concentrated solutions of iron sulphate or copper sulphate.

Fungicides, insecticides, and spraying directions, G. E. Stone and H. T. Fernald (*Massachusetts Sta. Bul. 123, pp. 3–32*).—Formulas are given for the preparation of fungicides and insecticides, with directions for their use in the prevention and control of fungus and insect pests. The authors give specific directions for the treatment of greenhouse, field, and garden plants for the control of their principal enemies. A brief note is given in conclusion on the treatment of weeds on lawns, tennis courts, walks, etc.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The game resources of Alaska, W. H. Osgood (*U. S. Dept. Agr. Yearbook 1907, pp. 469–482, pls. 2, maps 3*).—Among Alaska's game animals are some of the largest and finest in the world, as the giant moose and the huge brown bears. Its game resources compare favorably with the western part of the United States in early days and at the present time is one of the most important game regions in the world. So far no species have been exterminated, but the traffic in wild game already is a matter of serious moment and difficult to regulate. The several kinds of game resident in Alaska are considered, and a description of their number, habits, and recent history, and of the nature of the country is given. Three maps are given showing the distribution of moose, deer, caribou, mountain goats, and mountain sheep in Alaska.

Destruction of wolves and coyotes, V. Bailey (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 63, pp. 11, fig. 1*).—According to supervisors' reports of the Forest Service, here summarized, there were killed in or near National forests in 1907 1,723 wolves and 23,208 coyotes. Notes are given as to the dates of breeding and number of pups per litter in Wyoming, New Mexico, Michigan, Wisconsin, Minnesota, and Arkansas. It is reported that elk have been found to protect stock in pastures from dogs and wolves, and it is suggested that this may become an important use for elk. Directions for destroying wolves are republished, with slight change, from Circular 55 of the Biological Survey previously noted (E. S. R., 19, p. 51).

The rabbit as a farm and orchard pest, D. E. Lantz (*U. S. Dept. Agr. Yearbook 1907, pp. 329–342, pls. 2, fig. 1*).—A general account is given of the distribution of rabbits in the United States, their protective powers, breeding and feeding habits. The damage they inflict on field crops, gardens, trees, nurseries, and forest plantings is considered. Means of repression, including natural enemies, hunting, drives, trapping, and poisoning, and the protection of crops and trees by rabbit-proof fences and other means are discussed.

Rabbits and the western flora, R. W. Peacock (*Agr. Gaz. N. S. Wales, 19 (1908), No. 1, pp. 46–48, figs. 2*).—The flora of the western grazing regions of New South Wales has been greatly influenced by the ravages of rabbits. Not only are grasses and small shrubs attacked but even trees up to a diameter of 7 in. are said to have been felled and leaves, branches, and trunks devoured by hungry rabbits.

Destruction of the cotton boll weevil by birds in winter, A. H. Howell (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 64, pp. 5, map 1*).—A continuation of the investigation conducted by the Biological Survey (E. S. R., 19, p. 551), on the food habits of birds in relation to their destruction of the boll weevil. Collections were made of birds found in and about cotton fields in central and northwestern Louisiana during January and February, 1908. Six hundred specimens, representing 50 species, were secured, of which 20 species and 81 individuals, or 13.5 per cent, were found to have eaten boll weevils. It was found that more birds were feeding upon the weevils and that many more weevils were being destroyed by them than in any of the more western localities where birds have been collected at a corresponding season. A record is given of the birds examined which had eaten boll weevils with brief notes on the status of the more important winter birds. The relatively greater importance of weevil destruction in winter is mentioned and emphasis is placed upon the need for rigid protection of each and every species of bird known to feed upon the pest.

Food habits of wood pigeons, W. E. Winton (*Jour. Bd. Agr. [London], 14 (1908), No. 11, p. 686*).—Observations were made on the food habits of wood

pigeons during winter and spring. These birds were found to feed largely upon oak galls, the seeds of turnips and rape, wild berries, and the succulent roots of *Potentilla anserina* exposed in plowing fields infested with this weed.

Does it pay the farmer to protect birds? H. W. Henshaw (*U. S. Dept. Agr. Yearbook 1907, pp. 165–178, pls. 4*).—The insectivorous and vegetarian birds and their food habits are discussed by the writer, and their importance as destroyers of insects is emphasized. Directions for the protection of birds from man, and means of attracting them to the farm and of protecting crops from their attacks are given.

An account of the Biological Survey of the Department of Agriculture, H. W. Henshaw (*Nat. Geogr. Mag., 19 (1908), No. 2, pp. 79–118, figs. 38*).—A popular account is presented of the relation of birds and other animals to agriculture, with particular reference to the work of the Biological Survey of this Department and its study of the agricultural relations of birds and mammals. The author also mentions the establishment of game preserves and the means of guarding against the importation of dangerous animals.

Index-catalogue of medical and veterinary zoology, C. W. Stiles and A. Hassal (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 39, pts. 20, pp. 1493–1574; 21, pp. 1575–1624*).—A continuation of the index catalogue of medical and veterinary zoology, part 20, containing the names of authors from Naab to Nystrom and part 21, names from Obenaus to Ozzard.

Sixth report of the state entomologist and plant pathologist of Virginia, J. L. Phillips (*Rept. Va. State Ent. and Plant Path., 6 (1906–7), pp. 99, pls. 3*).—In this report a general account is given of the work of the entomologist during 1906–7 with particular reference to nursery and orchard inspection. Methods of treatment are suggested for nursery stock, together with brief statements of the requirements of various States regarding the shipment of nursery stock. A detailed report is made of the work of orchard inspection in the various counties of the State.

Proceedings of the twentieth annual meeting of the Association of Economic Entomologists (*Jour. Econ. Ent., 1 (1908), No. 1, pp. 1–76*).—At the twentieth annual meeting of the Association of Economic Entomologists held in Chicago, December 27 and 28, 1907, a number of papers were read, the more important of which are noted in the following paragraphs.

President H. A. Morgan in his annual address discussed The Relation of the Economic Entomologist to Agriculture (pp. 11–15). Particular attention was given to the recognition of the importance of economic entomology in the work of the land-grant colleges, and in the recent State and Federal operations in controlling the insect pests of the Southern States.

The relation between Cultivation and Susceptibility to Insect Attack was considered by J. B. Smith (pp. 15, 16). It is stated that as a rule vigorous sappy growth is more generally infested and injured by scale insects than slow hardy growth and that trees in well cultivated orchards and highly fertilized are more susceptible to attack than trees in sod or under cultural neglect. It has also been observed that infestation of young trees is of more serious consequence than that of older trees and that trees which have been persistently treated for years without success often clean themselves of scale after being abandoned and thereafter remain practically free.

Observations on the Biology and Food Habits of the Cecidomyiidæ were given by E. P. Felt (pp. 18–21). The author gave biological notes on a number of gall insects on various wild species of plants.

W. Newell discussed the habits and economic importance of *Iridomyrmex humilis* (pp. 21–34). This ant, commonly known as the New Orleans ant, has proved to be one of the most serious household pests wherever it has become

established. It also attacks the predaceous ant which feeds upon the boll weevil. The New Orleans ant feeds upon meat, lard, honey, sugars, cakes, and nearly all the food products, and multiplies to such an extent that great difficulty is experienced in preventing its injuries. The insect is described in all its stages.

W. A. Hooker called attention to habits and methods of study of ticks (pp. 34–51), discussing such matters as host relationship, adaptations as factors in this relationship, geographical distribution, and life history of ticks and methods used in breeding ticks. He also gave A Review of the Present Knowledge of the Rôle of Ticks in the Transmission of Disease (pp. 65–76), in which the literature of this subject is briefly discussed in connection with a bibliography and tables are presented showing the zoological position of parasites transmitted by ticks and also the classification of ticks.

W. D. Hunter announced A Tentative Law on the Incubation of the Eggs of the Cattle Tick (pp. 51–55). It appears that the total effective temperature required for hatching the eggs of the cattle ticks varied from 840 to 1510° F. In about one-half of the tick-infested area eggs deposited after the middle of September do not hatch until spring.

The Relation of Temperature to the Hibernation of Insects is considered by E. D. Sanderson (pp. 56–65). The thermal-constant for insects is defined as "that accumulation of the mean daily temperature above the critical point of the species which will cause it to emerge from hibernation or to transform from any given stage." The observations reported by the author were made on tent caterpillar, brown-tail moth, and codling moth.

Thirty-eighth annual report of the Entomological Society of Ontario (*Ann. Rpt. Ent. Soc. Ontario, 38 (1907), pp. 136, pls. 4, figs. 47*).—At the forty-fourth annual meeting of the society held in Guelph, October 31 and November 1, 1907, a number of papers were read the more important of which are noted below.

President J. Fletcher in his annual address (pp. 9–15) called attention to some of the tangible results which have been accomplished by economic entomology and discussed the liberality of the United States in providing funds for entomological research.

A conference was held on fruit-tree insects (pp. 15–22) at which a number of pests were considered including fruit-tree bark beetle, codling moth, oyster-shell bark-louse, terrapin scale, San José scale, and woolly aphis.

Brief reports were made on the insects of the year by C. H. Young (pp. 22–27); on The Gipsy and Brown-Tail Moths in Massachusetts, by A. H. Kirkland (pp. 27–31); on nocturnal insects, by T. W. Fyles (pp. 31–34); and on the collection and rearing of dragon flies, by E. M. Walker (pp. 43–50).

T. D. Jarvis presented A Preliminary List of the Scale Insects of Ontario (pp. 50–72), in which remedies are suggested for the more important species of scale insects. The preparation of lime-sulphur wash was discussed by L. Caesar (pp. 72–82). The minimum strength of this wash is considered to be 20 lbs. lime and 15 lbs. sulphur per 40 gals. of water. It is recommended that the mixture be boiled vigorously for 1 hour. It is an effective wash not only against scale insects and plant lice but is also of value in the control of peach-leaf curl, gooseberry mildew, plum rot, and pear scab. Among the other papers presented at this meeting the following may be mentioned: An Unusual Outbreak of Halisidota Caterpillars, by A. Gibson (pp. 82–85); Insect Galls of Ontario, by T. D. Jarvis (pp. 85–94); Injurious Insects in Ontario in 1907, and An Outbreak of the Variegated Cutworm, by C. J. S. Bethune (pp. 95–102); and Entomological Record for 1907, by J. Fletcher and A. Gibson (pp. 113, 114).

Some factors influencing insect development, C. Hennings (*Biol. Centbl., 27 (1907), pp. 324–337, pl. 1*).—The experiments reported in this paper were carried out chiefly on *Tomicus typographus*. It was found that the deposition of the eggs could be delayed at least 2 days by lowering the temperature 3 or 4° C., or by increasing the moisture content of the area. The same modification of these factors also prolonged the period of egg laying sometimes to the extent of 5 days. Similarly the larval and pupal stages were considerably elongated by increasing the moisture content or reducing the temperature.

Increase in the weight of pupæ kept in an atmosphere with a high content of carbon dioxid, Countess von Linden (*Sitzber. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, 1907, I, pt. A, pp. 1–11*).—Pupæ of a number of species of lepidoptera were kept in an atmosphere containing 5 per cent or more of carbon dioxid. By means of careful weighings and gas analyses, it was determined that the pupæ absorb carbon dioxid from the atmosphere and utilize it directly in the formation of carbohydrates, thus increasing their weight.

Some critical observations on the European species of the genus Chermes, E. R. Burdon (*Jour. Econ. Biol., 2 (1908), No. 4, pp. 119–148, pls. 2*).—The author gives a detailed account of the various developmental forms observed in 10 species of this genus. In discussing material for the identification of species he takes up the characters furnished by the insects themselves and also the characters furnished by the galls produced by the insects.

Intercortical scale formation and the development of Diaspis fallax, H. Morstatt (*Centbl. Bakt. [etc.], 2. Abt., 20 (1907), No. 4–5, pp. 150–153*).—According to the author's observations the scale of the female of *Diaspis fallax* and certain other scale insects of this group is partly composed of the extreme outer layer of cork tissue of the host plants upon which the scales are found.

The biology of plant lice, A. Mordwilko (*Biol. Centbl., 27 (1907), pp. 529–550; 561–575; 747–767; 769–816, figs. 25*).—The author discusses the whole cycle of the biology of plant lice with particular reference to heterogony, especially as observed in plant lice and in the alternation of generations which characterizes a large number of species of this group.

The interrelations of ants and plant lice, A. Mordwilko (*Biol. Centbl., 27 (1907), pp. 212–224; 233–252, figs. 5*).—An elaborate description is given of the mutual relations between various species of ants and the plant lice which they attend. Particular attention is given by the author to a discussion of the theories for explaining the origin of this relation and its economic significance.

The polymorphism of ants, with an account of some singular abnormalities due to parasitism, W. M. Wheeler (*Bul. Amer. Mus. Nat. Hist., 23 (1907), pp. 1–93, pls. 6*).—Detailed observations were made on *Orasema viridis* and a species of Mermis as parasites in ant colonies and on the effects produced upon the ants by these parasites. A large portion of the paper is occupied with a general discussion of the origin of parasitism of ants as related to the polymorphism observed in this group of insects.

The fungus-growing ants of North America, W. M. Wheeler (*Bul. Amer. Mus. Nat. Hist., 23 (1907), pp. 669–807, pls. 5*).—Detailed descriptions are given of a number of species of Atta and other genera of this family of ants which are distinguished by their habit of cultivating fungi for food. The theories which have been proposed for explaining the origin of this habit are critically discussed by the author.

Wild bees, wasps, and ants, E. Saunders (*London, [1907], pp. XIII+144, pls. 4, figs. 28*).—The purpose of this volume is to present in a simple form an account of the wild species of bees, wasps, ants, and other related hymenoptera

belonging to the group Aculeata of which about 400 species are known in Great Britain. The author discusses the habits and life history of a number of these insects, particularly solitary bees, digger wasps, solitary wasps, social wasps, bumblebees, and ants.

The book of garden pests, R. H. Pearson (*London, 1908, pp. XIII+214, pls. 17, figs. 51*).—In the present volume the author attempts to cover the subject of insect pests and fungus diseases affecting garden plants in Great Britain, but not including the pests of forest trees, shrubs, and field crops. Special chapters are devoted to insecticides, fungicides, and the pests of tuberous plants, fruit-trees, vegetables, etc.

Practical remedies for insect pests, H. M. Lefroy (*Agr. Jour. India, 2 (1907), No. 4, pp. 356–363*).—There are a number of important insect pests in India requiring the application of the best modern sanitary methods for their control. It is practically impossible, however, to apply these methods at present for the reason that most of the natives do not appreciate the necessity of them. Fortunately a number of simple methods are known for certain pests and these may be applied with good results if the cooperation of a considerable neighborhood is secured. The stem borer of cotton may be held in check by removing and burning withered plants. Similarly with another cotton pest known as the dusky bug, successful treatment is found in removing the affected bolls.

Insects injurious to seeds, P. Bargagli (*Agr. Colon. [Italy], 1 (1907), No. 2, pp. 143–148, pls. 2*).—Brief biological notes are given on grain weevils and other insects injurious to wheat, barley, corn, Kafir corn, flat pea, chick-pea, etc. Particular attention is given to the life history of *Caryoborus pallidus*.

The frit fly (*Schweiz. Samen Untersuch. u. Versuchsanst. Zürich Flugbl., 1908, No. 3, pp. 2, figs. 2*).—In the region of Zürich the frit fly is considered the most important insect enemy of oats. Brief notes are given on the life history of the pest. It may be controlled by early sowing, deep seeding, the liberal use of fertilizers, fall plowing, and the selection of slender stemmed varieties of oats.

The codling moth or apple worm, A. L. Quaintance (*U. S. Dept. Agr. Yearbook 1907, pp. 435–450, pls. 4*).—An estimated shrinkage in the value of the apple crop of approximately $12,000,000 annually, and an additional sum of not less than $3,000,000 or $4,000,000 for expenses incurred in its control, is charged to the presence of this insect in the apple orchards of the country. The character of the injury, and the life history and habits of the pest, with variations in the number of generations are given. Its natural enemies, artificial methods of control, and benefits obtained therefrom are described.

The woolly aphis of the pear tree, P. Passy (*Rev. Hort. [Paris], 80 (1908), No. 4, pp. 82, 83, fig. 1*).—A brief description is given of the injury caused by woolly aphis to pear trees. The best results in destroying this pest have been obtained from the use of insecticides containing some alcohol, the alcohol being of advantage by intensifying the penetration of the insecticide into the body of the aphis.

The scale insects of citrus trees, C. W. Howard (*Transvaal Agr. Jour., 6 (1908), No. 22, pp. 265–277, pls. 3, figs. 2*).—Descriptive and biological notes are given on a number of scale insects affecting oranges and other citrus trees in the Transvaal. Particular mention is made of *Chrysomphalus aonidum, Lepidosaphes beckii, L. gloverii, Icerya purchasi*, orange aphis, and orange psylla. In suggesting remedies for these pests the author presents formulas for the preparation of resin wash, castor-oil emulsion, soap wash, and kerosene emulsion.

The San José scale, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1908), No. 9, pp. 267–296*).—It is proposed to establish a number of demonstration orchards in the fruit-growing regions of Pennsylvania for the purpose of applying standard remedies for San José scale for the benefit of orchardists who may

wish to observe modern methods in this work. A statement is given of the plan under which this work will be carried out. Notes are also given on nursery inspection and on commercial and homemade insecticides.

Spraying experiments for 1907. L. F. HENDERSON (*Idaho Sta. Bul. 61, pp. 3–15*).—The author finds that scalecide at the strength of 1:15 kills San José scale as well as any spray, but that it is not effective when used 1:20. Salt added to lime-sulphur sprays was found to be of no value, and large amounts of sulphur added do not appear to increase the effectiveness of the spray. A late fall and an early spring application for the scale is recommended. Spraying at the time of flowering with Bordeaux mixture injures the fruit, causing a russet appearance at the time of picking. A dust spray gave as good results for codling moth as liquid spray, and the weaker sprays of arsenate of lead gave as good results as the stronger. The author considers salt essential to the efficiency of the Niagara, Rex, and Piper sprays for peach leaf-curl.

Spraying in an off year. F. E. DENNY (*Bul. Nebr. State Hort. Soc., No. 16, pp. 7*).—As some doubt is often entertained regarding the profitableness of spraying, especially in the seasons when insect pests and fungus diseases are not particularly in evidence, the economic aspect of spraying was carefully studied by the author, especially during 1906–7. The combination of Paris green or lead arsenate and Bordeaux mixture was used in protecting apple trees against codling moth and apple scab. It was found that the average gain per tree due to spraying was $2.13, or about $85 per acre.

Lime-sulphur for use against San José scale. J. L. PHILLIPS (*Va. Crop Pest Com. Circ. 5, n. ser., pp. 12, figs. 10*).—The formula recommended for lime-sulphur wash calls for 15 lbs. each of lime and sulphur per 50 gal. of water, the mixture to be boiled for 40 minutes and then strained. Directions are given for the preparation of cooking appliances and for the application of the wash.

Dipping of nursery stock in the lime-sulphur wash. P. J. PARROTT, H. E. HODGKISS, and W. J. SCHOENE (*New York State Sta. Bul. 302, pp. 175–202, pls. 2*).—Experiments were made to determine the value of lime-sulphur wash as a dip in disinfecting nursery stock for such pests as the San José scale, woolly aphis, and other destructive insects. Tests were made of the standard lime-sulphur wash at temperatures of 60°, 100°, 120°, and 212° F. The stock used consisted of Bartlett pears, Ben Davis and Mann apples, Satsuma plums, and Fitzgerald peaches. The time period of the immersion varied from instantaneous up to 10 minutes.

The results of these experiments indicate that dipping nursery trees in the standard lime-sulphur wash for the purpose of destroying the San José scale is a doubtful practice. Nurserymen are advised to continue the use of fumigation with hydrocyanic-acid gas.

The currant bud mite and the hazel bud mite. R. S. MACDOUGALL (*Jour. Bd. Agr. [London], 14 (1908), No. 11, pp. 676–679*).—Both *Eriophyes ribis* and *E. avellanæ* live in the buds of their host plants, causing them to swell greatly. These species have sometimes been confused, and the author therefore presents in parallel columns their distinguishing characteristics. Most species of this genus feed upon only one species of plant or in a few instances upon more than one species of the same genus.

Mosquito blight of tea. C. M. HUTCHINSON (*Planters' Chron., 3 (1908), No. 1, pp. 21, 22*).—During the year 1907 the mosquito blight was unusually severe in tea plantations. It had previously been shown that kerosene emulsion is an effective remedy against this insect, but that it is too expensive. Experiments were therefore undertaken to devise an equally effective but cheaper remedy. This purpose was achieved in a simple soap mixture containing 1 lb. of soap

per 20 gal. of water. This mixture may be applied at the rate of 300 gal. per acre at a cost of less than one-half that of the application of the kerosene emulsion.

Thrips on cocoa, H. A. Ballou (*Bul. Dept. Agr. Jamaica, 6 (1908), No. 1, pp. 8–11*).—A brief account is given of the nature of the injury by thrips to the leaves and pods of cacao. Directions are given for the preparation and application of rosin wash, kerosene emulsion, and rosin and whale-oil soap compounds.

On the structural characters of three species of Coccidæ affecting cocoa, rubber, and other plants in Western Africa, R. Newstead (*Jour. Econ. Biol., 2 (1908), No. 4, pp. 149–157, figs. 3*).—The species discussed by the author include *Stictococcus sjostedti*, *Pulvinaria jacksonii*, and *Palæococcus theobromæ*, the last two being described as new species.

Notable depredations by forest insects, A. D. Hopkins (*U. S. Dept. Agr. Yearbook 1907, pp. 149–164*).—A history is given of the depredations in Europe and America by the defoliating and bark-boring insects.

For Europe, the "nonne" moth (*Liparis monacha*), pine spinner (*Dendrolimus pini*), gipsy moth (*Porthetria dispar*), false caterpillars, and the eight-tooth pine bark beetle (*Tomicus typographus*) are mentioned and attention is called to the danger of their introduction into this country. An account follows of the depredations in America by the larch worm, pine butterfly (*Neophasia menapia*), gipsy moth, spruce-destroying beetle (*Dendroctonus piceaperda*), Englemann spruce beetle, Black Hills beetle (*D. ponderosæ*), western pine beetle (*D. brevicornis*), destructive pine beetle (*D. frontalis*), hickory bark-borer (*Scolytus quadrispinosus*), and locust borer (*Cyllene robiniæ*).

It is stated that nearly all great invasions by forest insects in Europe and this country have been more or less of a periodical nature, which is explained as due to various natural causes that operate only after the greatest damage has been done. Most of the bark beetles can be kept under complete control with little or no expense by proper adjustments in forest management and lumbering operations.

Experiments in using various species of trees as trap trees for bark beetles, W. Sedlaczek (*Centbl. Gesam. Forstw., 34 (1908), No. 2, pp. 45–73*).—The trees used in these experiments included silver fir, larch, Norway spruce, and Austrian pine. Reasonably satisfactory results in attracting bark beetles were obtained by ringing these trees in various ways or felling them. Later the trunks may be treated in such a way as to destroy the beetles.

Insects injurious to loco weeds, F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Bul. 64, pt. 5, pp. 33–42, figs. 7*).—An account is given of the insects instrumental in reducing the abundance of stock-poisoning loco weeds in the semi-arid regions of the West. The false-indigo gall-moth (*Walshia amorphella*), which as a caterpillar feeds at the roots and crowns of locos, is apparently the principal insect destroyer. Other insects mentioned as attacking loco weeds, particularly *Astragalus mollissimus* and *Aragallus lamberti*, are the loco root-maggot (*Pegomya lupini*), fickle midge (*Sciara inconstans*), four-lined loco weevil (*Cleonus quadrilineatus*), yellow loco fly (*Tritoxa incurva*), spotted root fly (*Euxesta notata*), bur-clover aphis (*Aphis medicaginis*), and meal snout-moth (*Pyralis farinalis*), as well as plant bugs, leaf hoppers, and miscellaneous insects. Some of these insects are considered as highly beneficial, since they have completely rid large areas of loco weeds.

The value of insect parasitism to the American farmer, F. M. Webster (*U. S. Dept. Agr. Yearbook 1907, pp. 237–256, figs. 24*).—An account is given of the great value of parasites in reducing the amount of injury due to several destructive insects, notably the spring grain-aphis (*Toxoptera graminum*) by

Lysiphlebus tritici, the Hessian fly by *Polygnotus hiemalis*, the army worm (*Heliophila unipuncta*) by *Winthemia quadripustulata*, and grasshoppers by parasitic flies as *Melanoptus differentialis* by *Sarcophaga georgina*. The perpetual benefits derived from parasites and their artificial introduction and diffusion are related.

Fruit fly parasites, G. C. Baker (*Jour. Dept. Agr. West. Aust., 16 (1908), No. 1, pp. 27, 28, pl. 1*).—It is stated that after three unsuccessful attempts to establish in Western Australia a parasite of the fruit fly, success has at last been achieved, one generation of parasites having already been bred there. The attempt will be made to breed other parasites to assist in controlling fruit flies.

Anatomy, biology, and pathogenicity of Ixodes reduvius, V. E. Vorontzov (*Anatomiya, Biologiya, i Patogennost Kleshtshei vida Ixodes redurius. St. Petersburg: Govt., 1907, pp. 41, pls. 3*).—The author discusses in detail the anatomy and biology of *Ixodes redurius* with particular reference to its agency in carrying hemoglobinuria of cattle. This disease has definitely been shown to depend upon the ticks for its transmission. The eggs of *I. reduvius* may retain their vitality under water in swampy areas from fall until spring.

The tsetse fly in India, H. M. Lefroy (*Agr. Jour. India, 2 (1907), No. 4, pp. 374–376*).—On account of the importance of the tsetse fly as a carrier of animal and human diseases an investigation was made to determine whether this fly occurs in India. According to the evidence thus far accumulated it does not appear to be found in India, and in the author's opinion the likelihood of accidental importation is quite remote.

Apiculture, E. Chavez (*Apicultura. Mexico: Govt., 1907, pp. 12*).—This pamphlet contains an account of the conference of apiculture held at the agricultural and industrial fair at San Luis Potosi. The chief subjects discussed were the necessity of studying local bee plants and the influence of insects, particularly bees, on the fertilization of plants.

Bee diseases in Massachusetts, B. N. Gates (*U. S. Dept. Agr., Bur. Ent. Bul. 75, pt. 3, pp. 23–32, map 1*).—Both American and European foul brood have been found to exist in practically every quarter of Massachusetts and Connecticut as well as in the other New England States. There seems to be undeniable proof that their introduction is not recent, and that there are fewer bees kept on the farms than there were 50 years ago seems to be due in part to the effect of these diseases. A map is given showing the distribution of the two diseases in Massachusetts and the possible sources of infection from neighboring States.

FOODS—HUMAN NUTRITION.

Changes taking place in chickens in cold storage, Mary E. Pennington (*U. S. Dept. Agr. Yearbook 1907, pp. 197–206, pls. 7*).—A summary and discussion of data obtained in a study of the appearance and characteristics of freshly killed fowls and poultry stored respectively ten months, two years, and three years.

In the stored poultry changes in appearance and character were noticeable, being much greater in the samples stored for a long period than in those in storage for a shorter time. In the case of chickens in storage for three years, changes in the texture and color of both muscles and fat were striking. There was a very considerable drying out, particularly in the muscles of the upper breast and between the muscles the bands of fat were shrunken and of a deep brown-orange color. "No feature of the entire chicken was more striking by comparison with the fresh fowl than this change in the color of the fat.

"The most striking difference between this chicken stored for three years and those stored for shorter periods or those which are fresh is this pronounced inflexibility and the general green tint of the skin. The whole appearance of the bird was unpleasant in the extreme. The odor was not that of putrefaction, but was of a sharp, penetrating, unpleasant character having a biting property, which suggested the effect of acrolein on the eyes and nostrils. While this was plainly detected in the unopened bird, the muscles and the viscera gave it far more distinctly, and a decided increase in its intensity was noticed while the study was progressing."

Other differences in the chickens examined are also pointed out and refrigeration and refrigerator methods are discussed.

"The changes in the chickens which have been described are not the most pronounced of their kind, other specimens exhibiting more marked degenerations and some showing better conditions. These were, rather, alterations representing as nearly as possible the mean.

"Such being the case, the dictum of the warehousemen that there is no change in cold-storage poultry and that it may be kept for an indefinite period can not be accepted in its entirety. Both microscopic study and the taste of the cooked fowl confirm the fact that macroscopically visible degeneration does take place.

"Considering the enormous growth and the wide extent of the refrigeration of foodstuffs, as well as the absolute lack of authoritative supervision of such frozen products before they are offered for sale, it seems most desirable that a careful study should be made to determine whether such alterations as have been noted affect the appearance and histological integrity of the flesh only, or whether, as has been asserted by some, the consumption of poultry after long periods of cold storage is not responsible for some of the obscure intestinal disorders and the imperfect metabolism from which modern humanity, especially the dwellers in large cities, are so apt to suffer."

The grades of wheat in the Manitoba inspection division, crop of 1907 (*Canada Cent. Expt. Farm Bul. 60, pp. 7–21*).—This bulletin consists of two articles.

(1) *The milling and baking qualities of the grades of wheat in the Manitoba inspection division, crop of 1907, by C. E. Saunders* (pp. 7–11).—Manitoba hard, Manitoba northern, and commercial grade wheats of the crop of 1907 were studied in comparison with the results of earlier work, milling tests and baking tests being made. The majority of the samples showed the effects of water and frost.

"The crop of 1904 [see a previous note (E. S. R., 17, p. 379)] was of an unusual character owing to the prevalence of rust. It was therefore to be expected that the grades of the past season would show some points of difference from those of 1904. The flours from the grades of 1904 showed a lower water absorption and a lower protein content than those of 1907 . . . but gave bread of larger volume, especially in the lower grades. These observations perhaps justify the conclusion that wheat which is lacking in plumpness on account of the action of rust will produce better flour than wheat, of about the same degree of plumpness, which has been injured by frost."

(2) *A chemical study of the grain and flour of the grades of wheat, 1907, by F. T. Shutt* (pp. 12–21).—In general the samples were characterized by a decidedly high protein content which it is pointed out might indicate superior rank for bread-making purposes, though according to the author it might in some degree be due to immaturity and so not necessarily be an indication of greater strength as applied to bread making, though it might imply higher value from

a nutritive standpoint. "Frosted wheat, as we have frequently shown, is possessed of a higher percentage of protein than similar wheat that has come to a normal ripeness without frost; it is, in other words, immature wheat. It might be argued that this explanation would only apply in a consideration of the lower grades—those showing the effects of frost—but it is not improbable owing to the backward season last year that in some districts at least a considerable amount of wheat was cut in a 'greener' condition than usual and that this failed to thoroughly ripen in the stook."

The relationship of the weight of the kernel to wheat per bushel and the percentage of straight grade flour was not as obvious, according to the author, as in earlier work, and the same was true of the relationship between protein, gliadin and dry gluten, observed in normally ripened wheats. "The absence of this relationship probably results from the effect of frost, so observable in the lower grades.

"No differentiation of the flours can be made from their protein content; throughout the series there is no marked departure from the average (12.24 per cent).

"The flours of the first three grades give somewhat higher results for gliadin and gliadin ratio than do those of the lower grades. This may point to some relation between maturity and gliadin content, the more fully ripened wheat containing the larger proportion of gliadin. . . .

"The percentages of water-soluble constituents in the flours increase from the first to the last of the series, the increase being chiefly in the nitrogen and ash-free extract or carbohydrates. This agrees in a measure with the sugar results as obtained from both aqueous and alcoholic solutions, but does not fall into line with the data for the volume of loaf produced. There is here no confirmation of Wood's theory [E. S. R., 19, p. 457] that volume of loaf increases with the percentage of sugar present; indeed the evidence is directly to the contrary. It is, however, only right to add that in this series there may be a disturbing influence from the presence of immature or frosted grain.

"The exact nature of the water-soluble carbohydrates of the flours is unknown but is evidently worthy of study. As the volume of loaf is seen to decrease with the increase of this component it seems more than probable that volume is influenced by the amount of soluble constituents, or at all events that such is the case in flours from immature or frosted wheats.

"The results of the present series lend some confirmation to Wood's theory that the shape of loaf is influenced by the ratio to the protein (or total nitrogen) of the soluble ash constituents."

The chemistry of strength of wheat flour, II, T. B. Wood (*Jour. Agr. Sci., 2 (1907), No. 3, pp. 267–277, pls. 2*).—The experiments reported were made in continuation of earlier work (E. S. R., 19, p. 457).

The author studied especially the influence of variations in acidity and the amount of soluble salts in flours upon baking quality and the general effect of acids and salt solutions upon the character of gluten. It was found that gluten immersed in distilled water would retain its coherence for some time, probably until bacterial changes occurred, or if the water were frequently changed, until all acids and salts had been removed. In dilute acid solutions, however, gluten began to disintegrate and lose its coherence, while strong acid solutions produced coherence. Common salt added to the solutions tended to maintain the coherence of the gluten, and this relation was studied with different proportions of several salts.

The experiments reported, according to the author, "show quite clearly that the physical properties of gluten are entirely altered by changing its surround-

ings." In general, "the properties of gluten depend on the nature and concentration of acid and salts in the solution with which it is in contact, and the connection between the properties of gluten and the concentration of acid and salts is a peculiar one which would not be made evident by comparison of analytical figures with bakers' marks. . . .

"The properties of gluten which vary with concentration of acid and salt are coherence, elasticity, and water content, and it is suggested that these properties have an important bearing on the shape of the loaf, and that a knowledge of the acidity and soluble salt content of a flour gives a clue to the factor of strength which decides whether the flour will make a good-shaped loaf.

"Finally, it is suggested that the method of investigation adopted may be expected to throw light on all problems depending on the manipulation of proteids, cheese making being especially mentioned."

Report on the manufacture and sale of vermicelli, called song-thân and hô-tiêu, SANDRÉ (*Bul. Écon. Indo-Chine, n. scr., 10 (1907), No. 67, pp. 805–808, figs. 13*).—These 2 sorts of vermicelli are made by natives in Indo-China, the first from green beans (*Phaseolus radiatus*), white beans (*Dolichos albus*), and rice, and the second from manioc. The processes followed are briefly described.

Hawaiian honeys (*Hawaii Sta. Bul. 17, pp. 7–21, pl. 1*).—The bulletin is made up of two articles.

(1) *The source and characteristics of Hawaiian honeys, by D. L. Van Dine* (pp. 7–12).—In connection with a study of apiculture in Hawaii the author has studied the source and characteristics of Hawaiian honeys. It is pointed out that Hawaiian honeys are of two distinct types: A floral honey "which compares very favorably with the official definition of honey and is derived mainly from the flowers of algeroba, and a honeydew product very decidedly abnormal in its chemical composition." Between these two types, and partaking of some of the characteristics of each, are natural honeys that are the result of some of the bees in a hive visiting flowers where floral nectar is gathered and others visiting sugar cane where honeydew is collected, the character of the product being determined by the relative proportion of the nectar and honeydew gathered and stored. "So long as there is an abundance of flowers, the honey produced will be wholly of the first type, but as the supply of floral nectar decreases the bees visit the cane fields, where they collect honeydew, and when there is a dearth of flowers honeydew alone is collected. This condition results in natural combinations of the two types, which show every gradation from the pure floral product to that derived wholly from honeydew."

As the author points out, algeroba honey does not depart from the requirements of the official standard except in its high ash content (0.44 per cent).

"Algeroba honey is nearly water white in color and solidifies soon after extraction. Its delicate flavor recommends the product for table use.

"Honeydew honey is noncrystalline and usually of a very dark color. The aroma is very similar to that of molasses and the taste insipid. The product is abnormally high in ash, the amount ranging from 1 to 2 per cent, and it has a decided right-handed polarization.

"On account of its wide variation, Hawaiian honey can not be sold on sample. Polarization is necessary to determine whether or not the product is optically right or left handed.

"The algeroba and other natural honeys produced in Hawaii which polarize to the left essentially come within the standard definition of honey, since they meet all the requirements, with the exception of the ash content. The honeydew honey and other natural Hawaiian honeys which polarize to the right should be designated by a modifying term, such as is included in the phrase 'honeydew

honey.' Such honey may further be described as a natural product containing no added glucose or other added sugars. It is a product gathered and stored by the honeybee and as such is unadulterated.

"The present official definition of honey is based on examinations of types of well-known floral honeys and represents honey sold and used for table consumption. For this trade, color and aroma are all-important. On the other hand, more than 50 per cent of the honey produced in the United States is used in the baking and confectionery trade. For this trade, color and aroma are of less importance. The value of honey for baking purposes depends on its baking and boiling properties. Honey is used in bakestuffs and candies for the reason that it imparts a texture and degree of moisture that other sugars will not give. Buyers assert that Hawaiian honeydew honey has better baking and boiling properties than the higher grade algeroba honey, and one local company received from one-half cent to 1 cent more per pound for their honeydew honey than they did for the algeroba product of the 1906 crop."

(2) *Chemical composition of Hawaiian honeys, by Alice R. Thompson* (pp. 13–21).—Analyses are reported of 49 Hawaiian honeys of known origin which were collected by the station entomologist, and were of two types, namely, floral honeys and honeydew products, and natural mixtures of the two types. The methods followed are described.

Concerning coffee, K. Gorter (*Bul. Dépt. Agr. Indes Néerland., 1907, No. 14, pp. 62; Liebig's Ann. Chem., 358 (1908), No. 3, pp. 327–348; 359 (1908), No. 1–2, pp. 217–244*).—Extended chemical studies of coffee led the author to conclude that its chief constituent is the caffein potassium salt of chlorogenic acid, a dibasic acid with a melting point of 206° to 207°. By means of its salts and cleavage products the character of this acid was studied and a structural formula is proposed. A pectin body was found in coffee beans which gave mucic acid on oxidation with nitric acid and galactose and pentose when hydrolyzed. A new acid was isolated from coffee in crystalline form, having the formula $C_{34}H_{54}O_{15}$ and a melting point of 255°, for which the name "coffalic acid" is proposed. On cleavage with acid and alkali it gave isovaleric acid.

An oxidase was identified in Liberian coffee beans which produced color with the potassium caffein salt of chlorogenic acid. The caffetanic acid of earlier investigators is not a distinct chemical compound, according to the author, but a mixture of chlorogenic acid, coffalic acid, and other substances.

On the preparation and sale of vinegar, in relation to the administration of the sale of food and drugs acts, J. M. Hamill (*Local Govt. Bd. [Gt. Brit.], Med. Dept., Rpts. Insp. Foods, 1908, No. 5, pp. 28*).—On the basis of personal observation and data collected from a variety of sources, the author discusses the manufacture of malt and other brewed vinegars, distilled vinegar, wine, spirit, and other vinegars, artificial vinegars, and concentrated and fortified vinegars, the possible vinegar impurities, and related questions with special reference to the food and drugs acts of Great Britain.

An appendix by A. Harden contains a summary of the results of the examination of vinegar by public analysts and a compilation of legislation regarding vinegar in the United States, Italy, and certain of the British dominions.

Fruit juice statistics, 1907, A. Bömer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 129, 130*).—A summary of data reported in the following studies.

Concerning fruit juices for the year 1907, A. Behre, F. Grosse, and K. Thimme (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 131–139*).—The authors expressed and examined a number of samples of different sorts of fruit juices.

Concerning the composition of fruits and berries and the value of chemical analyses in judging marmalade, together with fruit statistics for the year 1907, E. Baier and P. Hasse (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 140–143*).—The analyses of fruit and fruit juices reported were made with a view to securing data for the use of food chemists.

Concerning fruit juices and marmalades for the year 1907, K. Fischer and K. Alpers (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 144–147*).—A number of analyses of fruit juices and marmalades are reported, which were undertaken to secure data for judging of the quality of fruit products.

Fruit juice statistics for the year 1907, F. Schwarz and O. Weber (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 147, 148*).—Analyses are reported of 14 samples of raspberry juice.

Concentrated fruit juice, A. Rönrig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 148–152*).—Analyses are reported of fruit juices made by a special process in which the aromatic principles are extracted with chloroform, the remaining juice concentrated, and the aromatic principles again added after freeing from chloroform.

Hungarian fruit juices, J. Halmi (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 3, pp. 153–160*).—A large number of analyses are reported and discussed.

The detail of the enforcement of the Food and Drugs Act, W. D. Bigelow (*U. S. Dept. Agr. Yearbook 1907, pp. 321–328*).—This paper discusses the administration and application of the Federal Food and Drugs Act of June 30, 1906. The enforcement of the law naturally proceeds along two lines, namely, the inspection of imported foods and drugs, and the inspection of domestic products. Such questions as invoices and certification, procedure, prosecution, and seizure and confiscation of illegal goods are considered.

"While it is plainly the purpose of the majority of the manufacturers and dealers to comply with the law, and the character of the foods and drugs on the American market has been greatly improved since its enactment, the prosecution of those who seek to evade it will doubtless cause still further improvement."

The nutrition of man, R. H. Chittenden (*New York, 1907, pp. XII+324, figs. 29*).—In this volume "the attempt has been made to give a systematic account of our knowledge regarding some of the more important processes of nutrition, with special reference to the needs of the body for food." In his discussions the author has incorporated the results of observations and experiments carried on during recent years by himself and his associates, and summarized and discussed this and other data, with special reference to modern physiological views. The subjects treated include foods and their digestion, absorption, assimilation and the processes of metabolism, the balance of nutrition, the source of energy of muscular work, with some theories of proteid metabolism, dietary habits and true food requirements, further experiments and observations bearing on true food requirements, the effect of low proteid diet on high proteid animals, and practical applications of the theories and deductions presented.

The author upholds the position advanced in earlier writings (E. S. R., 16, p. 685) that the protein intake may be materially less than the usual dietary standards require, and in his discussion of this question he quotes the results of a number of experiments with dogs on what he considers a low proteid diet in which the subjects maintained nitrogen equilibrium and body weight, or in some cases made slight gains. For instance, one of the dogs lived for ten

months "with perfect comfort and in good condition on an average daily intake of 0.26 gm. of nitrogen per kilogram of body weight, and with an average fuel value of 70.3 calories per kilogram," while another animal as shown by a twelve months' test required 0.31 to 0.33 gm. nitrogen per kilogram of body weight. For a third dog under observation for nine months "proteid consumption equaling 0.30 gm. of nitrogen per kilogram with a total fuel value in the day's food of 66 to 70 calories per kilogram, was clearly quite sufficient to maintain nitrogen equilibrium and body weight." Data for 3 other dogs are also quoted. In general, the diet contained only small amounts of animal food. According to the author's observations, the digestion of fat under these circumstances was normal.

In general, the author concludes that "the nutrition of man, if it is to be carried out by the individual in a manner adapted to obtaining the best results, involves an intelligent appreciation of the needs of the body under different conditions of life, and a willingness to accept and put in practice the principles that scientific research has brought to light, even though such principles stand opposed to old-time traditions and customs. The master words which promise help in the carrying out of an intelligent plan of living are moderation and simplicity; moderation in the amount of food consumed daily, simplicity in the character of the dietary, in harmony with the old saying that man eats to live and not lives to eat. In so doing there is promise of health, strength, and longevity, with increased efficiency, as the reward of obedience to Nature's laws."

Food and diet in the United States, C. F. LANGWORTHY (*U. S. Dept. Agr. Yearbook 1907, pp. 361–378*).—Popular ideas regarding diet, the object of dietary studies, methods of interpreting results of such investigations and similar questions are discussed with special reference to the dietary work which has been carried on in the United States. A brief summary is given of the results of American and other dietary studies, and it is pointed out that in the interpretation of results of such studies age, sex, muscular work, and similar factors must be taken into account. The dietary standards suggested for man in full vigor at moderate muscular work follow:

Dietary standard for man in full vigor at moderate muscular work.

	Protein.	Energy.
	Grams.	*Calories.*
Food as purchased	115	3,800
Food eaten	105	3,500
Food digested	95	3,200

Estimations of the amount of mineral matter required per man per day are also given, the values quoted being deduced from a summary of available data.

Estimated amount of mineral matter required per man per day.

	Grams.		Grams.
Phosphoric acid (P_2O_5)	3–4	Calcium oxid	0.7 –1.0
Sulphuric acid (SO_3)	2–3.5	Magnesium oxid	.3 –0.5
Potassium oxid	2–3	Iron	.006–0.012
Sodium oxid	4–6	Chlorin	6 –8

The differences between so-called dietary standards and physiological requirements are discussed as well as the adequacy of the American diet, kind of food eaten in American homes, and similar questions.

"An extended survey of the literature of food supply and the food habits of many races makes it plain that in no country is there a greater variety of readily accessible foods of good quality than in the United States and in none is there a more general use of a wide range of articles. Thanks to our varied climate, our ready means of transportation, and our facilities for marketing and handling food products, the contributions of any given locality are readily accessible in other regions. Skill in selecting from this great variety of food products and in the preparation of foods after they are purchased is essential if out of our abundance a diet is to be secured which is best suited to the needs of the American people. The dietary studies herein summarized and other similar reliable data seem to show that the people of the United States as a whole are adequately nourished as compared with other races. The acknowledged energy and achievement of the American people, together with their general good health and physical well being, certainly indicate that we have in the main used our food resources advantageously."

ANIMAL PRODUCTION.

Chemical studies on growth. I, The inverting enzyms of the alimentary tract, especially in the embryo. L. B. Mendel and P. H. Mitchell (*Amer. Jour. Physiol., 20 (1908), No. 1, pp. 81–96*).—The conclusions drawn from the authors' investigations with pigs, dogs, and chickens follow:

"The early appearance of inverting enzyms in the intestine of the embryo corresponds with the relatively early specialization and histological development of the portion of the alimentary tract here investigated. The alimentary proteolytic enzyms, like the special glands which elaborate them, come into evidence at a comparatively late period. Maltase is the most universally distributed of all inverting enzyms. In the embryo pig maltase and lactase are found in the intestine, while sucrase is missing. After birth all three enzyms are present. In the full-grown pig lactase is not regularly found in all portions of the small intestine. In the newly born puppy all the enzyms are found.

"In birds other conditions prevail. Lactase is not found at any period; sucrase, on the other hand, is uniformly present in the newly hatched chick and the adult hen. One might be inclined toward a teleological explanation for the absence of lactase from the intestine of nonmammalian animals, and similarly for the absence of sucrase from the embryos of the pig, sheep, and cattle. Such considerations apply with less force, however, to the subsequent formation of sucrase, or its embryonic occurrence in birds. For the present, the statistics of the occurrence of the alimentary inverting enzyms must await a more adequate interpretation with respect to their functional significance. At any rate, it is safe to conclude that the alimentary tract of the young mammal is, as a rule, even more adequately equipped to digest and utilize the sugar of the milk than are the adults of the same species."

Chemical studies on growth. II, The enzyms involved in purin metabolism in the embryo. L. B. Mendel and P. H. Mitchell (*Amer. Jour. Physiol., 20 (1908), No. 1, pp. 97–116*).—The authors summarize the results of their investigations as follows:

"The nucleic acid of the liver of the embryo pig probably contains only two purin complexes—adenin and guanin.

"The liver is capable of undergoing autolytic changes at an early age. Nucleases are present which liberate purin bases from the nucleic acid complexes.

"The liver of the embryo pig contains adenase, even in its early stage of development, but no guanase. In this respect it shows the specific character of the liver of the adult animal.

"An extract of embryo viscera, other than the liver, readily gives indication of the presence of guanase at an early age.

"The unlike distribution of these two enzym reactions under comparable conditions of experiment give further evidence in favor of the existence of two distinct and specific deamidizing enzyms.

"It has not been possible to demonstrate the formation of uric acid from preformed or added purin bases (adenin or hypoxanthin) by extracts of embryonic tissues. The preliminary oxidative transformation of hypoxanthin to xanthin is likewise doubtful. Xantho-oxidase is not present in the embryo visceral organs of the pig; it is found, however, in the livers of the full-grown and suckling animals of the same species. The latter readily form uric acid from purins under suitable conditions.

"The uricolytic enzym has not been found in extracts of embryo pig tissues under conditions in which it is readily identified in the adult organs. The enzym appears either shortly before or after birth. These observations speak in favor of the specific uricolytic power of tissue extracts, and indicate that the destruction of uric acid in such solutions is not solely due to the alkalin reaction, etc., of the digesting medium.

"The tardy appearance of the oxidative and katabolic enzyms concerned in the transformation of the purins is suggestive as a characteristic of growing, synthetic organisms."

Chemical studies on growth. III, The occurrence of glycogen in the embryo pig, L. B. Mendel and C. S. Leavenworth (*Amer. Jour. Physiol., 20 (1908), No. 1, pp. 117–126*).—Quotations from the authors' summary of their paper follow:

"The . . . experiments [reported] can not be interpreted as giving evidence that a large glycogen content is a characteristic of embryonic structures or developing tissues; for the tissues, examined by adequate methods, show no unusual richness in this carbohydrate. The distribution is not markedly different from what pertains in the adult animal, except that the liver does not assume its glycogen-storing function early, at least in the pig. This conclusion seems as reasonable, in the absence of direct contradictory evidence, as to attribute the uniformly noted poverty in hepatic glycogen entirely to the deficient nutrition of the maternal animal. . . . The metabolism of glycogen in the embryo is doubtless comparable with its rôle in the nutrition of the adult; and it seems unnecessary to postulate any special formative property to account for its presence. Glycogen may thus be regarded simply as a store of nutrient energy rather than as a peculiar mark of histogenesis."

Chemical studies on growth. IV, The transformation of glycogen by the enzyms of embryonic tissues, L. B. Mendel and T. Saiki (*Amer. Jour. Physiol., 21 (1908), No. 1, pp. 64–68*).—Liver muscle and blood from pig embryos and liver from adult pigs were studied. The developing muscle tissue, which contains glycogen during embryonic life, gave evidence during the early stages of this period of a relatively greater glycogen-digesting power than that of liver tissue, which is free from glycogen.

"The principal feature to be emphasized in the present experiments is the variable equipment of amylolytic enzyms in the embryonic tissues and its correlation with developmental changes. The embryo liver, which is early free from glycogen, only gradually acquires its characteristic digestive capacity, the amylolytic efficiency increasing with growth."

Chemical studies on growth. V, The autolysis of embryonic tissues, L. B. MENDEL and C. S. LEAVENWORTH (*Amer. Jour. Physiol., 21 (1908), No. 1, pp. 69–76*).—Using tissues from pigs and pig embryos, a number of studies were made. "The equipment for autolytic tissue disintegration is present early in the embryo, even if it is held in check by the normal environment and reaction of the animal cells. . . . With the contention of certain investigators that these enzyms play no part in metabolism during life we are not at present concerned."

Chemical studies on growth. VI, Changes in the purin, pentose, and cholesterol content of the developing egg, L. B. MENDEL and C. S. LEAVENWORTH (*Amer. Jour. Physiol., 21 (1908), No. 1, pp. 77–84*).—Both hens' and ducks' eggs were used in the investigation undertaken to study the question of purin synthesis in developing eggs. It was found that purin increased during incubation, but not materially after hatching, in tests in which chicks were fed for 2 weeks on a practically purin-free diet of bread crumbs.

Determinations of the guanin, adenin, and hypoxanthin gave "further evidence of the progressive synthesis of purins taking place during the growth of the embryo, and they show that, as in the adult and embryo organs already examined, guanin and adenin are the predominating bases involved."

The proportion of pentoses was also found to increase during the incubation period, while the total ether extract and cholesterol diminished. The studies of fat constituents gave "no evidence of a synthesis of cholesterol in the processes incidental to the development of the chick. On the contrary, the cholesterol appears to disappear in part in company with the rest of the lipoid yoke substances which act here as sources of energy in growth."

Earlier work has been noted (E. S. R., 18, p. 660).

Chemical studies on growth. VII, The catalase of animal embryonic tissues, L. B. MENDEL and C. S. LEAVENWORTH (*Amer. Jour. Physiol., 21 (1908), No. 1, pp. 85–94*).—As in earlier studies of growth, material was obtained from embryonic and adult pigs. The experimental data show the early presence of the catalytic power in embryonic tissues, though considerable variations in the catalytic power of different organs were noted.

Chemical studies on growth. VIII, The occurrence of lipase in embryonic animal tissues, L. B. MENDEL and C. S. LEAVENWORTH (*Amer. Jour. Physiol., 21 (1908), No. 1, pp. 95–98*).—The results obtained in the studies of material from embryonic and adult pigs "gives evidence of the early presence of lipase in the liver and intestine of the embryo; but the activity of the extracts of these tissues is decidedly less pronounced than that of the comparable material from the full-grown animal."

Chemical studies on growth. IX, Notes on the composition of embryonic muscular and nervous tissues, L. B. MENDEL and C. S. LEAVENWORTH (*Amer. Jour. Physiol., 21 (1908), No. 1, pp. 99–104*).—According to the authors, the analytical data presented give further evidence of the comparatively high water content of embryonic tissues.

"Creatin is present in the embryonic muscle, the content being considerably lower than in full-grown animals.

"Among the purin bases obtainable from embryonic muscular structures, adenin and guanin preponderate as in other organs. Hypoxanthin is found free in the tissue, as in adult life.

"Lactic acid can be separated from embryonic muscular tissue, but in exceedingly small amount.

"The distribution of lipoids in the embryonic brain resembles that in 'gray' matter. Cholesterol is present at the earliest periods, while cerebrins are entirely absent."

The materials studied were obtained from embryonic and adult pigs.

The effect of drinking and salting food upon body weight and the water content of the organs, K. FARKAS (*Landw. Jahrb., 37 (1908), No. 1, pp. 51–105*).—The author's experiments were made with sheep, were numerous, and were carried out under a variety of conditions. The total body weight before and after slaughtering, the weight of blood, organs, etc., hourly variations in weight after the water was taken, and other questions were considered.

According to the conclusions reached, when sheep drank so much water that the body weight was increased 8 to 10 per cent it did not after 2 to 5 hours surpass the normal weight by more than 1 per cent. When a normal amount of water was taken the increase in weight was never more than 1 per cent and usually not more than 0.5 per cent. The effects of overdrinking were not noticeable after 5 hours.

If a sheep was given a large amount of salt and was then allowed to drink an excessive amount of water the body weight would be no more than 2.5 to 4.3 per cent greater than in the case of a sheep given no feed or water for 12 hours and not more than 1 per cent greater than that of a sheep given a normal amount of feed and water before slaughtering. These facts are of importance to the buyer, as, if a sheep is sold 10 or 12 hours after salting and watering, an appreciable part of the weight paid for is water contained in the body and not flesh.

The analytical data reported led to the conclusion that simple overdrinking without salt did not affect the water content of the organs even if it was continued for a long time. On the other hand, overdrinking when much salt was taken increased the water content of the lungs and heart and the fatty tissues more or less, and probably the weight of the muscles.

In the author's opinion, the digestive disturbances, loss of appetite, etc., noted when cattle are fed very succulent or wet feed is not so much due to the excessive water content as to the considerable amount of salt which is commonly supplied also.

Digestion experiments, G. S. FRAPS (*Texas Sta. Bul. No. 104, pp. 33*).—The digestibility of Kafir corn, milo maize and molasses, with a basal ration of cotton-seed meal and hulls, was studied with steers as subjects. In addition to the usual constituents the digestibility of the sugars, starches, and pentosans was determined, as was also the fertilizer value of the manure.

The average coefficient of digestibility of the basal ration and the feeds especially studied is shown in the following table:

Average coefficient of digestibility of feeding stuffs—Experiments with steers.

Kind of feed.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Cotton-seed meal and hulls (basal ration)	52.5	94.6	66.5	51.2	43.2
Kafir corn	63.9	78.1	85.4	.....	68.5
Milo maize	65.9	90.2	84.5	.....	.....
Molasses	56.7	.....	104.6	.....	104.4

The following table shows the values which were obtained for the digestibility of the crude fiber, the nitrogen-free extract, and the constituents of the nitrogen-free extract in the different materials studied:

Coefficients of digestibility of nitrogen-free extract and crude fiber.

Kind of feed.	Steer used.	Length of period.	Coefficients of digestibility.					
			Sugar.	Starch.	Pentosans.	Residue of nitrogen-free extract.	Total nitrogen-free extract.	Crude fiber.
Cotton-seed hulls and meals:	*No.*	*Days.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Percent.*
Period 1	1	3	95.4	29.8	86.5	54.0	69.0	54.6
Do	2	6	92.0	12.3	71.9	53.1	64.5	44.9
Period 4	2	8	95.7	28.0	82.9	49.2	65.2	52.1
Do	3	8	96.4	23.6	83.4	54.0	67.2	54.1
Kafir corn:								
Period 2	2	9	86.2	98.0	.....	(a)	82.4	.....
Do	3	3	78.3	96.6	.....	(a)	85.2	.....
Do	3	8	86.2	97.4	.....	(a)	81.3	.....
Milo maize:								
Period 2	2	8	116.3	99.8	.....	(a)	85.9	.....
Do	3	4	103.3	99.7	.....	(a)	83.2	.....
Do	3	8	93.7	99.6	.....	(a)	83.1	.....

[a] The quantity of residue digested was less than the quantity digested from the basal ration.

The author studied the material removed by cold water from the feces in three of his experimental periods and found that something over 3 per cent was soluble, "of which approximately one-third was ash, something over one-third was protein, and less than one-third nonprotein organic matter. About 10 per cent of the total protein, 20 per cent of the total ash, and 3 per cent of the nitrogen-free extract were soluble in water.

"While the above facts are of some interest it was not considered of importance to pursue the investigation further."

The author's summary and conclusions follow:

"The ration of cotton-seed meal and hulls fed in this experiment was digested to a much greater extent than the calculated digestion from average figures.

"The nutrients of the grain of Kafir corn and milo maize are somewhat less digestible than the corresponding nutrients in Indian corn.

"Indian corn has about 10 per cent greater value for feeding than Kafir corn or milo maize.

"The nitrogen-free extract of molasses is highly digestible.

"The productive value of different classes of feeds as measured by the fat produced, is not in proportion to their digestible constituents.

"Increase in crude fiber in a feed means a decrease in productive value.

"Sugars are digested 92 to 100 per cent, even when the reducing materials in the excrement are considered to be sugars.

"The apparent starch of cotton-seed hulls, which can not be true starch, though dissolved by diastase, has a low digestibility.

"The starch of Kafir corn and milo maize is almost completely digested.

"Although the nitrogen-free extract of milo maize and Kafir corn is composed almost entirely of starch, the nitrogen-free extract was digested to a much less extent than the starch. This difference is probably due to a depression of digestibility of the nitrogen-free extract of the meal and hulls. It appears possible that the nitrogen-free extract of starchy feeds is digested to a greater extent than is shown by digestion coefficients.

"It appears possible that crude fiber undergoes changes within the animal which render it soluble in acid or alkali and therefore a portion of the nitrogen-free extract.

"Forty per cent of the phosphoric acid, 25 per cent of the potash, and 48 per cent of the nitrogen, being 42 per cent of the fertilizing value of the feeding stuff, were excreted in the solid excrement.

"About 53 per cent of the total fertilizer value of these feeding stuffs passes into the urine.

"In feeding a ton of cotton-seed meal having a fertilizer valuation of $29.50 to fattening animals, that portion of its fertility which passes into the solid excrement has a valuation of about $12.40, and that which passes into the urine of about $15."

Silage for fattening cattle, B. E. CARMICHAEL (*Ohio Sta. Bul. 193, pp. 149–166*).—A test of the relative merits of corn silage and corn stover was carried on with five lots of seven each and one lot of six steers. On full feed the three lots fed silage received 25 lbs. per head per day, with 17 lbs. of corn and 2.5 lbs. of cotton-seed meal, and the dry-fed lots received 20 lbs. of shelled corn and 2.5 lbs. of cotton-seed meal. The steers were given all the dry coarse fodder they would eat up clean, corn stover being used in the early part of the test and hay of different sorts later. In the 140 days of the test the average daily gain of the steers on silage was 2.333 lbs. and on dry feed 2.313 lbs., the cost of a pound of gain being 9.04 cts. and 10.21 cts., respectively.

Data are recorded regarding the shrinkage in shipment and the manure production of the lots. From two to four pigs followed each lot of cattle, the average gain of those following the silage-fed steers being 1.027 lbs. per head and of those following the dry-fed steers 1.187 lbs. Some of the lots were fed one-third of a pound of tankage per day per pig. The average daily gain in these cases was 1.406 lbs.

"The results of this experiment indicate that silage may be used to good advantage in the fattening of cattle, when stover and hay are high in price. . . .

"No difference in the finish of the two sets of cattle was apparent. This was shown by the fact that, although when the cattle were at market one pen contained only silage-fed cattle and another only dry-fed cattle, a buyer of wide experience, without knowing how the cattle had been fed, purchased both lots at the same price. Other expert cattlemen failed to note any difference between the two lots of cattle.

"It is not to be expected that silage alone or silage and other rough feed will produce a high finish in a short feeding period, since not enough grain is present in the silage for this purpose. Less shelled corn was required, however, by the steers that received silage than by the ones that received only dry feed."

"High-priced feeds do not always prevent fair profits from being secured from feeding operations. Besides, the valuable by-product, manure, remains for use on the farm."

The results are not regarded as final and the experiments will be continued.

Feeding experiments with molasses, S. WEISER and A. ZAITSCHEK (*Landw. Jahrb., 37 (1908), No. 1, pp. 130–149*).—In experiments with steers, the authors conclude that satisfactory results were obtained when 7.64 to 8 kg. of molasses per 1,000 kg. live weight was fed as an addition to a basal ration of 4 kg. alfalfa hay, 2 kg. meadow hay, 3 kg. wheat chaff, and 5 kg. of clover or alfalfa seed screenings. The digestibility of the ration was studied.

In tests with horses, 2.3 kg. molasses fed in addition to 3.25 kg. maize, 3.2 kg. clover, and hay ad libitum gave very satisfactory results. The authors state that the animals remained in the best of condition and left nothing to be desired with respect to work performed. They did not sweat much even in the hot summer months. Four kg. of molasses per 1,000 kg. live weight was also well tolerated. When 5 to 5.5 kg. was fed for a long time no disturbance

in health or in ability to work was noted, but such large amounts of molasses rendered the feed sticky and therefore the animals did not learn to eat the feed so readily or like it so well.

Concerning the nutritive value of different sorts of screenings, F. Tangl and S. Weiser (*Landw. Jahrb., 37 (1908), No. 1, pp. 106–129*).—The authors studied the botanical composition of screenings from clover, alfalfa, and flax seed, and the digestibility of such material by farm animals. As larger coefficients of digestibility were obtained with steers than with sheep or pigs, the authors conclude that the sort of screenings studied can be more satisfactorily fed to the steers than to the other animals.

Concerning blood meal, A. Zaitschek (*Landw. Jahrb., 37 (1908), No. 1, pp. 172–180*).—From the experimental data reported the author concludes that pigs digested the crude fiber and nitrogen-free material of maize fed with blood meal less well than is the case when maize is fed alone. From the summary of data, however, he concludes that blood meal may be profitably used in fattening pigs on account of the relative cheapness of the protein which it supplies.

Kansas concentrated feeding stuffs law (*Kansas Sta. [Pamphlet], 1908, pp. 17*).—The text of the Kansas feeding stuffs law is quoted, the objects, scope and application of the law, the inspection tax, registration of feeding stuffs, analyses of samples and rulings under the law are discussed. The application of the law to condimental or medicinal stock foods is also considered.

The range problem in New Mexico, E. O. Wooton (*New Mexico Sta. Bul. 66, pp. 3–46, pls. 10*).—Physical features of New Mexico range lands, the financial value of such areas and their possibilities, are discussed, with suggestions for rational range management. Of the total area of the Territory, which is about 78,500,000 acres, "more than 90 per cent [is] now valuable for stock raising only and will probably always remain so."

The distribution of the main grass societies on the range is shown, those of most importance being the blue grama, black grama, Colorado blue stem, Arizona fescue, water grass, and salt grass societies. Weeds of different sorts are characteristic of particular kinds of overstocked ranges and a number of poisonous plants are present.

The present carrying capacity for the Territory is estimated as approximately 35 acres per head of cattle per year. The financial value of the range is estimated at from 2.5 to 5 cts. per acre per year, about the prices ordinarily paid. As the range is now run down and not so productive as it might be, or even as it once was, the author recommends that public grazing lands be placed under official control, preferably in his judgment under a cabinet officer and "a system of permits or leases be established under rules adapted to each separate region and governed by the conditions obtaining in the region. The fees should be large enough to support the staff necessary to carry the plan into effect. Some of the objections to this plan are considered. Points which must be covered by the regulations are submitted. These are largely based upon the experience of others."

Poultry work at the Maine Station, C. D. Woods (*Maine Sta. Bul. 157, pp. 203–218*).—The poultry investigations now under way at the station are described, the plans for future work are outlined and the principal lines of work which have been followed in the past discussed and some of the results obtained pointed out, particularly those which pertain to the use of curtain-front houses, dry mash feeding, crate fattening, methods of rearing chickens, and the collection of egg records and their use in breeding up laying strains.

In the discussion of the breeding experiments and the conclusions which may be drawn from the annual egg records it is pointed out that the amount of

variation in regard to egg yield is practically the same at the end as at the beginning of the work, namely from 0 to approximately 250 eggs per hen per year. "That is to say, after 9 years of selection with respect to egg production the birds breed no truer to a definite type of egg production than they did at the beginning. It will be recognized by every stock breeder that this is an important fact to be taken into consideration in passing opinion on the value of the method of breeding poultry which was tried in the experiment."

When the average egg yield is considered year by year there is no evidence of any increase in the egg production of the individual, that is, by selective breeding the average egg production has not been increased, and as a whole the results show "that the quality of high productiveness can not be regarded as any more a fixed characteristic of the station's strain of Barred Plymouth Rocks now than it was at the beginning of the experiment." The author points out that the records show no special change in the proportion of hens with very low egg yield to high producers in the flock, there being relatively few of the low egg producers at any time. Attention is called to the fact that the conclusions now presented differ somewhat from those presented earlier, owing to the fact that some sources of error have been found in the summaries previously published.

"The practical conclusion to be drawn from the results of this breeding experiment seems to the authors to be clear. It is that the improvement of a strain of hens in egg-producing ability by selective breeding is not so simple a matter as it has been supposed to be. Nothing could be simpler than breeding from high producers to get high producers. But if this method of breeding totally fails to get high producers—in other words, if the daughters prove not to be like the mothers in egg production—it can not fail to excite wonder as to whether the simplicity of the method is not its chief (possibly its only) recommendation. Anyone who makes a thorough, first-hand study of an extensive selection experiment carried out, as was this one, by the so-called German method without testing of the centgener power of the individual organisms, can not fail to be impressed, we believe, with the fact that the improvement of a race by selective breeding is a vastly more complicated matter than it is assumed to be by those who maintain that one need only to breed from the best to insure improvement. The supposed 'facts' of heredity on which the practical stock breeder (working for utility points) operates are in very large part inferences rather than facts. What is needed more than anything else for the advancement of the stock-breeding industry in all its phases is an accumulation of definite knowledge of the fundamental principles of the hereditary process. All breeding operations must be based on the laws of inheritance in organisms. The practical stock breeder is able to work out the applications of these laws for himself. What he most needs is broader and deeper knowledge of the laws themselves. This knowledge must come from thoroughgoing, purely scientific investigations."

Poultry keeping for egg production, W. P. Brooks (*Massachusetts Sta. Bul. 122, pp. 3–64, figs. 9*).—In this bulletin, which is designed as a guide to poultry keeping for egg production, houses for growing birds and for laying stock, questions of breeds, incubation, and brooding, and the general management and feeding of both chickens and laying stock are discussed. On the basis of personal experience and experiments made at the station and elsewhere, a summary is also presented of the 13 years' poultry experiments at the station, from which the following conclusions are drawn:

The regular use of condition powder is unlikely to increase the egg product and is unnecessary as a means of insuring health. Cabbages given in moderation are superior to cut clover rowen as winter food for egg production, but if

the amount given is large, the flavor of the eggs is injuriously affected. The number of eggs produced is not affected by the presence of the male, but the average weight of the egg is increased.

"Concentrated vegetable foods such as soy bean meal, linseed meal, gluten meals, etc., should not be used to replace all or even a very large part of animal foods, such as meat or animal meals, beef scraps, cut bone, [illegible] etc. The dry prepared animal foods such as beef scraps and animal or meat meals, if of good quality are cheaper and safer feeds than cut fresh meat and bone and can be so used as to produce an equal egg yield.

"Feeding the mash in the morning, with care not to give too large a quantity, is preferable to feeding it at night. The differences in egg yield on the two systems are small, but giving the mash at night especially in winter must mean empty crops and gizzards long before morning.

"Corn may safely be largely used in rations for laying hens, but its use requires unusual care not to overfeed for best results, and it must be supplemented by a liberal proportion of animal food. With such care and so supplemented, the use chiefly of corn, whole or cracked, and corn meal rather than much wheat and wheat or corn by-products is attended with the following advantages: Lower food cost both per day and per egg, rather more eggs, higher average weight of fowls and better market quality when dressed and an earlier and better molt.

"Buckwheat in any large proportion is a less desirable food for laying fowls than corn . . . Under otherwise similar conditions the less [hard tough] fiber in the ration, the better will be the egg product. Oats, barley, buckwheat and by-products containing the husks of these grains should be sparingly used."

The relative live weight of the organs in chickens, A. Zaitschek (*Landw. Jahrb., 37 (1908), No. 1, pp. 150–171*).—No regular differences in weight were noted in the organs of chickens grouped according to the amount of gains made. The percentage amount of blood, however, was noticeably lower in the case of chickens which had been most quickly, that is, most satisfactorily fattened. In general, the author concludes from the large number of weighings which were made, that the gain in weight is proportionally distributed among the several organs regardless of the method of fattening. In the case of 131 Hungarian chickens, the average dressed weight was 79 per cent of the live weight.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Conditions affecting the proportions of fat and proteins in cow's milk, L. L. Van Slyke (*Jour. Amer. Chem. Soc., 30 (1908), No. 7, pp. 1166–1186*).—The summary of this article as presented by the author is chiefly as follows:

The deductions presented are based upon: (1) 300 analyses of the mixed milk of numerous herds, obtained at cheese factories such as are common in the dairy regions of New York State; (2) 650 analyses of milk of 50 separate herds of cows, covering a period of about six months; and (3) several thousand analyses of milk of individual cows, representing seven different breeds of cows (American Holderness, Ayrshire, Devon, Guernsey, Holstein Friesian, Jersey, Shorthorn), covering several lactation periods for each individual, and an aggregate of about 100 periods of lactation.

General range of variation in the percentage of fat and proteins in milk.—(1) In single milkings of individual cows, the fat varied from 2.25 to 9 per cent, the total proteins from 2.19 to 8.56 per cent, the casein from 1.59 to 4.49 per cent, and the albumin from 0.31 to 5.32 per cent. The highest percentages are found in case of cows far along in lactation. (2) In the case of individ-

ual herds of cows, such as are common in dairy regions of New York State, the fat varied from 2.90 to 5.50 per cent, the total proteins from 2.31 to 3.71 per cent, the casein from 1.70 to 3.02 per cent, and the albumin from 0.41 to 0.97 per cent. (3) In the case of milk consisting of a mixture of the milk of many different herds of cows, the fat varied from 3.04 to 4.60 per cent, total proteins from 2.53 to 3.76 per cent, casein from 1.93 to 3 per cent, and albumin from 0.47 to 0.88 per cent.

Conditions affecting variations of fat and proteins in milk.—The following conditions are considered as of special prominence: (1) Individuality, (2) breed, (3) stage of lactation, (4) food, (5) season, (6) time and manner of milking, including fractional milkings, milk from different quarters of udder, and relative order of milking a quarter of udder.

Conditions affecting the relation of fat to total proteins and to casein in milk.—(1) The breeds studied fall into two general groups; in one case, the ratio of fat to proteins is relatively high (Guernsey and Jersey); in the other, relatively lower. Individuals of the same breed may vary considerably in this respect. (2) The ratio of fat to proteins is very uniform through the lactation period until about the ninth month, when the total proteins increase quite rapidly in relation to fat. The ratio of fat to casein is very uniform throughout the entire period of lactation, there being a slight increase of casein in relation to fat about the ninth month. (3) Variations in composition of milk due to manner of milking affect the fat more or less extensively but the proteins very little.

Conditions affecting the relation of casein to albumin.—Albumin in milk varies quite widely in relation to casein. The relation varies (1) with different breeds, (2) with different individuals of the same breed, (3) with time and manner of milking, (4) the relation is quite uniform during the first eight or nine months of lactation, after which the albumin increases relatively more than the casein.

Methods of calculating casein and total proteins in normal milk.—In the case of herd milk containing 3 to 4.50 per cent of fat, the following formula for calculating the amount of casein has been found to give, in most cases, quite satisfactory results:

$(F-3) \times 0.4 + 2.1 =$ percentage of casein in milk (F equals number representing percentage of fat in milk). Total proteins in milk can be roughly estimated by the following modification of the preceding formula: $(F-3) \times 0.4 + 2.8 =$ percentage of proteins in milk.

The relation of fat and casein in milk to yield of cheese.—In milk of average composition (3.6 to 3.8 per cent of fat) the yield of fresh cheese from 100 lbs. of milk may be ascertained by multiplying the number representing the percentage of fat in milk by 2.7. The yield of cheese may be calculated more closely for milks containing fat below 3.6 or above 3.8 per cent, when the percentage of both fat and of casein in milk is known, as follows: (Casein $\times 2.5$) + (Fat $\times 1.1$) = pounds of fresh cheese made from 100 lbs. of milk.

The relation of fat and casein in milk to composition and quality of cheese.—Cheese made from milk in which fat is high relative to casein is superior in quality to cheese made from milk in which fat is low relative to casein. Skim-milk cheese, whole-milk cheese and cream cheese owe their difference in quality to the difference in relation of fat to casein in milk.

The relation of fat to proteins in milk as a basis for detecting skimmed milk and skimmed-milk cheese.—In the case of herd milk as commonly found in New York State, the milk is open to the suspicion of being skimmed when the percentage of fat is less than that of proteins. Cheese of the Cheddar type which

contains more than 1 part of proteins for 1.2 parts of fat is made from skimmed milk.

The reducing properties of milk, P. Sommerfeld (*Hyg. Zentbl., 4 (1908), No. 1, pp. 1, 2*).—From tests with the use of a 0.5 per cent solution of neutral red in sterile water the author concludes that the reducing properties of milk are not due to preformed reducing ferments but are of bacterial nature.

Bacteria in milk, L. A. Rogers (*U. S. Dept. Agr. Yearbook 1907, pp. 179–196, figs. 6*).—Bacteria in milk, milk flavors, souring of milk, sweet curdling and digestion, bitter milk, stringy or ropy milk, disease-producing bacteria in milk, care and handling of milk, and related questions are discussed in this general summary of micro-organisms in relation to milk.

"While bacteria are in no way essential to milk, they may be considered as normally present in milk, cream, ice cream, butter, and cheese. They may even occur in milk or its products in very large numbers without making it an unsafe food or in any way decreasing its food value.

"Bacteria known to produce disease are seldom isolated from or counted in milk, and bacteriological counts should be taken merely as an indication of the way in which milk has been collected or the temperature at which it has been held. High numbers usually indicate insanitary conditions, careless handling, or old milk. However, milk may be collected under very poor conditions and the bacterial count held down by a liberal use of ice. On the other hand, milk collected in the most sanitary manner may in a few hours contain a large number of bacteria if it is held at a high temperature. Low counts may be due not to clean stables and low temperatures, but to the use of antiseptics.

"Every effort should be made by legitimate means to secure milk with a small number of bacteria, but milk or foods made from milk should not be indiscriminately condemned because they sometimes contain bacteria in numbers which are startling to those not familiar with the nature of these indispensable plants."

Bacterial associations in the souring of milk, C. E. Marshall and Belle Farrand (*Mich. Sta. Spec. Bul. 42, pp. 3–63*).—Studies were made of the entire microbial content of a number of samples of milk in continuation of earlier work (E. S. R., 17, p. 496), in which investigations were confined to selected micro-organisms. "In this work, the micro-organisms isolated from a definite sample of milk are employed for purposes of association with the lactic micro-organism also isolated from the same sample."

The conclusions drawn from the investigations follow:

"Bacteria, ordinarily found in milk, may or may not facilitate the growth of lactic micro-organisms.

"About 57 per cent of the associate micro-organisms when grown in combination with the specific lactic micro-organisms accelerate their growth and action.

"The relative number of each micro-organism introduced into the combination may or may not have a decided influence upon the acceleration of the growth of the lactic micro-organisms of lactic fermentation.

"Acceleration may occur at the beginning of the fermentation, or at the end, or at any stage between.

"The means by which this acceleration of lactic fermentation is produced is not the same in all cases. It appears to be due to products manufactured by the associate micro-organisms, sometimes stable to heat, sometimes unstable; sometimes under alkaline conditions, sometimes under acid conditions; sometimes with apparent digestion, sometimes with no apparent digestion.

"It is very doubtful whether these products combine with the inorganic or casein constituents of milk, as is the case of lactic acid, so as to permit the lactic micro-organisms to grow more freely.

"The period at the beginning of lactic fermentation during which no lactic acid formation can be determined, and during which the number of bacteria is continually increasing, may be greatly shortened by vigorous associate bacteria influencing the lactic micro-organisms.

"Usually the associate micro-organisms disappear with the formation of appreciable amounts of lactic acid; yet the associate micro-organisms may continue or persist, causing an abnormal lactic fermentation.

"Associate micro-organisms may influence lactic fermentation by producing 'off flavors,' 'off aromas,' and an unusual high degree of acidity. Even the character of the acid may be completely changed.

"It follows that the elimination of 'fifth' bacteria is the only means of eliminating the product causing lactic acceleration, inasmuch as the products may be so stable as not to be destroyed by ordinary means of milk treatment."

Bacterial associations in the souring of milk, C. E. MARSHALL and BELLE FARRAND (*Centbl. Bakt.* [*etc.*], *2. Abt., 21 (1908), No. 1–3, pp. 7–59*).—See abstract above.

Variation in the chemical composition of butter, C. CROWTHER (*Univ. Leeds and Yorkshire Council, Agr. Ed.* [*Pamphlet*] *66, 1907, pp. 3–23*).—Data are reported regarding the percentage composition and the Reichert-Wollny number of 126 samples of butter prepared from cream produced on one farm during two years, and these are discussed in considerable detail with reference to the results of studies made on the causes of variation in the water content of the butter and in the proportion of volatile acids. The water content of butter, according to the author, is very largely determined by the nature and amount of working to which the butter is subjected, though a considerable number of other factors also affect it, as the degree of softness of the butter fat, the average size of the butter grains, the temperature of churning and of the water used for washing, the intervals between two workings, the use of dry or moist salt in working, and others. The chief factors affecting the proportion of volatile acids present are the stage of lactation of the cows, the climatic and other conditions affecting their comfort, and the character of their food.

On the relation between clean skimming and clean churning, J. JONAS (*Maelkeritid., 21 (1908), No. 11, pp. 195–202*).—In experiments conducted at Ladelund Dairy School (Denmark) cream containing principally small fat globules gave a buttermilk richer in fat than cream with mostly large globules, and though with very clean skimming (0.05 to 0.07 per cent by the Gottlieb method) the buttermilk was richer in fat than when more fat was left in the skim milk, the yield of butter was increased to a much larger extent. It is therefore important that the milk be skimmed as clean as possible.

Babcock test for butter fat, J. H. FRANDSON (*Idaho Sta. Bul. 63, pp. 6, figs. 4*).—General information regarding the method of operating the Babcock test, prepared in response to inquiries from teachers and farmers.

Researches into some of the chemical changes involved in hard cheese production, T. A. COWARD (*Univ. Leeds and Yorkshire Council, Agr. Ed.* [*Pamphlet*] *68, 1907, pp. 3–23*).—From the results of investigations considered in more or less detail the author concludes that "hard cheese manufacture depends in part, at least, on rennet-enzyms-acid proteolysis, whereby physical and chemical changes are brought about in the curd. In practice, however, it will evidently be necessary to gage all the agents concerned in both these series of changes rather than any selected one, for, from the foregoing experiments

and studies, it follows that the quantity and type, especially of the unorganized ferments added with the rennet; the condition of the proteid when the enzyms are added; the rate as well as the amount of acid development; the condition of the curd when weighting is done, and the extent to which in young cheeses the organisms other than the lactic bacteria exceed the 3:97 proportion; is each able to cause physical and chemical divergencies, which divergencies, if not observed and dealt with during the process of cheese manufacture, will render unattainable the ideal permanent characteristics assumed to be the ultimate aim of the hard-cheese-maker's art."

Butter, cheese, and condensed milk, E. C. BULLOCK (*Bur. of the Census [U. S.], Manfr. 1905, pt. 3, pp. 305–339; Bul. 64, pp. 9–43*).—"This report contains (1) a statistical discussion of the manufacture of butter, cheese, and condensed milk in the United States and in the various States, and the foreign trade in butter and cheese; (2) a discussion of milk products and by-products."

Dairying industry (*Off. Yearbook N. S. Wales, 1905–6, pp. 405–416, pl. 1*).—Statistics regarding the production of milk, butter, and cheese in New South Wales are given.

Report of the dairy test associations of Östergötland County, Sweden, 1906–7, K. A. WESTMAN (*Östergötlands Läns Hushåll. Sällsk. Handl. 1908, No. 1, pp. 72, fig. 1*).—The report shows that 40 test associations, with 454 different herds and 16,897 cows, were in operation during the year or a greater portion thereof. Detailed statements of the average production per herd are given, with kinds and quantities of feed given, the production of milk, butter, fat, and butter per 100 feed units, and also the production price per kilogram of milk, butter fat, and butter.

Milk records, J. SPIER (*Trans. Highland and Agr. Soc. Scot., 5. scr., 20 (1908), pp. 235–258*).—Statistics are given regarding the yield in milk and butter fat of 3,931 cows tested by 7 agricultural societies during the year 1907.

The results discussed clearly indicate the immense improvement in milking stock obtained by judicious breeding. It is also pointed out that "cows producing a large quantity of milk of good quality do so at a much less cost for food per gallon of milk than those yielding half the produce."

Milk and butter tests at the Lincoln show, 1907, E. MATHEWS (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 138–152*).—A considerable amount of statistics is reported and briefly discussed.

Fat in milk (*Jour. Brit. Dairy Farmers' Assoc., 22 (1908), pp. 83–90*).—The percentages of fat in both morning and evening milk are given for each day except Sunday for an entire year for two herds, one entirely Shorthorns and one mostly this breed with a few Jerseys.

Dairy supervision branch (*Rpt. Dept. Agr. [Victoria], 1905–1907, pp. 38–68, figs. 13*).—The results of the administration during 1907 of the milk and dairy supervision act of 1905 are reported.

Official laboratory of the Province of Quebec, A. L. TOURCHOT (*Rpt. Min. Agr. Prov. Quebec, 1907, pp. 287–375*).—An account of the operations of the laboratory during the year 1907, including a report of tests of 2,087 pieces of apparatus for use in the dairy industry, 350 analyses of milk, a study comprising analyses and bacteriological examinations of 18 samples of rennets from different sources, 96 analyses of butter, and 25 analyses and 36 bacteriological examinations of cheese.

Report of the dairy institution at Memmingen, 1907, K. TEICHERT (*Jahresber. Milchw. Untersuch. Anst. Memmingen, 1907, pp. 15*).—The activities of the institute during the year are summarized.

Investigations on dairy science and dairy practice in the year 1907, II. semester, R. W. RAUDNITZ (*Separate from Monatsschr. Kinderheilk., 6 (1907),*

No. 11, pp. 36, fig. 1).—This includes a list of references to the literature and brief reviews of the important results of the investigations.

Milking machines. I. LINDSTRÖM (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), Nos. 1–2, pp. 6–20, figs. 14*).—An historical sketch and general discussion of the problem of machine milking, with illustrations of the more important machines.

Vinification. P. PACOTTET (*Vinification. Paris, 1908, pp. XII+568, figs. 125*).—An extended treatise on the subject of wine making, considering the results of both scientific experiments and practical experience.

The technical manufacture of chemically pure levulose. S. STEIN (*Internat. Sugar Jour., 10 (1908), No. 113, pp. 218–221*).—The author points out the possibility of producing levulose on a commercial scale from inulin. As a source of the latter substance he suggests the use of either dahlia bulbs, which contain 10 to 12 per cent, or chicory root, which contains 6 to 11 per cent, either of which can be produced on a large scale. According to his calculations the levulose could be made from them and sold at a profit at 12 cts. a pound.

VETERINARY MEDICINE.

Proceedings of the American Veterinary Medical Association (*Proc. Amer. Vet. Med. Assoc., 44 (1907), pp. 563, figs. 75*).—A general acount of the forty-fourth annual convention of the association at Kansas City has already been given together with abstracts of the papers read at the meetings (E. S. R., 19, pp. 198–200). The following notes refer to articles not read at the meetings or matters not considered in the previous abstract.

M. E. Knowles describes the symptoms and occurrence of infectious lip and leg ulceration of sheep (pp. 419–424). This disease is quite widely distributed in Montana, occurring on high prairies far away from swampy areas. Sheep of all ages are susceptible. In some cases 60 per cent of the herd has become infected. The chief symptom is necrosis of the tissue about the hoof and upon the lips. If neglected these lesions may become serious. The disease is apparently due to the necrosis bacillus. Ordinarily all cases ultimately recover in the spring, particularly if well fed and cared for.

L. E. Willyoung drew attention to the importance of preventive medicine in army veterinary work (pp. 425–429). The army veterinarian is in a position to apply preventive measures very effectively and under the strictest discipline. Some of the general orders for the regulations of army veterinarians, however, are not based on scientific principles.

An account of the French-Canadian breed of horses was presented by J. A. Couture (pp. 467–471). The history of the development of this breed of horses is briefly outlined and a statement is given of its distinguishing characteristics.

A complete list is given by L. R. Baker of the pathological exhibit prepared by the inspectors of the Bureau of Animal Industry for demonstration purposes. A number of papers were also presented on the educational phases of veterinary medicine. G. H. Roberts made a plea for more cordial intercollegiate relations between the different veterinary schools (pp. 493–501). W. L. Williams gave an outline discussion of subjects which should be taken as preparatory work for veterinary medicine (pp. 502–516).

Report and recommendations regarding veterinary colleges in the United States (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 133, pp. 13*).—A report is given by a committee of five veterinarians appointed by the Secretary of Agriculture for the purpose of obtaining information regarding the course of instruction now

offered at the various veterinary colleges in this country and Canada. Nineteen veterinary colleges were inspected. Recommendations are made as to the matriculation examination and course of instruction necessary to qualify graduates for admission to the civil service examination for the position of veterinary inspector in the Bureau of Animal Industry.

Proceedings of the zootechnic council. G. Gorio (*Ann. Agr. [Italy], 1907, No. 253, pp. 444*).—A complete account is given of the proceedings of the council appointed by the King of Italy for the improvement of domesticated animals in that country. At the various meetings of this council discussions were held regarding the methods of improving cattle, sheep, and the other domesticated animals of Italy.

The practice of immunization, O. Schreiber (*Deut. Tierärztl. Wchnschr., 15 (1907), No. 49, pp. 689–691*).—With the discovery of the possibility of immunization by means of blood serum a great amount of interest was awakened on this subject and numerous experiments have been carried on by various investigators. Preliminary results announced in the treatment of animal diseases by means of blood serum have frequently led to disappointment. The author calls attention to the necessity of further work, particularly in the study of the antagonistic action between the sera of different animals.

The theory of serum activity. O. Bail and E. Hoke (*Arch. Hyg., 64 (1908), No. 4, pp. 313–426*).—The purpose of the investigations which are reported in this paper and which were continued for a period of 2 years was to determine the nature and the action of serum on bacteria. The authors come to the conclusion that the precipitating and bacteriolytic action of serum are one and the same, for the reason that both of these properties are lost by heat. Ordinary sera retain their precipitating power at slightly higher temperatures than their bacteriolytic power. The difference, however, is simply one of degree. Both of these properties are destroyed by treating the serum with cultures of living vibrio or with extracts from cultures of cholera vibrio.

Is acquired immunity inherited? D. Konrádi (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), Nos. 1, pp. 41–48; 2, pp. 139–148*).—The author tested the possibility of hereditary immunity in dogs which were vaccinated for rabies. It was found that both the mother and the developing young became immune simultaneously, but that the immunity in the young animals after birth persisted for a longer time than in the mother. The vaccine is in such cases probably transmitted to the young through the placenta rather than through the milk after birth. When the mother dog was immunized some time before becoming pregnant some of the young showed an immunity to rabies while others did not.

The prevention and eradication of stock diseases in South Africa. A. Theiler (*Transvaal Agr. Jour., 6 (1908), No. 22, pp. 217–233, pl. 1*).—A historical statement is given regarding the introduction of animal plagues into South Africa. The first to appear in epizootic form were contagious pleuropneumonia, rinderpest, Texas fever, and East Coast fever. These are still the most important diseases among cattle. Glanders is widely prevalent among horses and mules. Animal industry in South Africa is particularly afflicted with diseases due to animal parasites. In the eradication of piroplasmoses it is possible to proceed either by way of destroying the ticks which carry these diseases or by immunization of all susceptible animals. The destruction of ticks is of no avail unless the work is organized on an extensive plan in which all stockmen affected cooperate.

Carbolic acid in the treatment of bacterial diseases, J. W. Pollock (*Vet. Rec., 20 (1908), No. 1025, pp. 611, 612*).—Satisfactory results are reported from the internal use of carbolic acid in cases of tetanus, septicemia, contagious abortion, cattle plague, and septic conditions of the stomach in cattle and dogs.

Spore formation and other biological processes of the anthrax bacillus, V. Růžička (*Arch. Hyg., 64 (1908), No. 3, pp. 219-294, pls. 3*).—As a result of an extended study of the minute anatomy and staining reactions of the anthrax bacillus the author comes to the conclusion that this bacillus corresponds to a naked nucleus as compared with the usual structure of a protozoan organism.

The action of anthrax serum, A. Ascoli (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), No. 2, pp. 178–188, pls. 2*).—The physiological action of anthrax serum can not be explained by the hypotheses which have been proposed for explaining the effect of other vaccinating sera. The active substance of anthrax serum is apparently derived from amboceptors and the serum itself does not hasten the destruction of anthrax bacilli either in vitro or in the living animal. In the experiments reported by the author a constant parallelism was found between the protective and bactericidal action of the serum.

Combating anthrax and blackleg by protective vaccination, Warringsholz (*Berlin. Tierärztl. Wchnschr., 1908, No. 6, pp. 93–95*).—The general application of methods of vaccination in the control of anthrax and blackleg is not recommended except in localities where these diseases are known to prevail extensively. The results of vaccination thus far reported are very satisfactory.

The value of the Straus symptom in the diagnosis of glanders, Liénaux (*Ann. Méd. Vét., 57 (1908), No. 2, pp. 65–69*).—In a number of cases reported by the author great difficulty was experienced in reaching a rapid diagnosis of glanders. The pus that comes from suspected cases does not always produce infection in guinea pigs and the reaction from mallein is not always decisive. The Straus reaction is considered as of great importance.

On some nonspecific reactions of mallein, H. J. Südmersen and A. T. Glenny (*Jour. Hyg. [Cambridge], 8 (1908), No. 1, pp. 14–36, charts 8*).—A series of experiments was carried on to determine whether other bacterial products injected hypodermically into immune horses may cause local reactions similar to those which follow the administration of mallein. The bacterial products used in these experiments included tuberculin and filtrates or toxins from coli bacillus, typhoid bacillus, *Bacillus enteritidis*, streptococci, staphylococci, diphtheria bacillus, proteus, lactic-acid bacilli, etc. It was found that bacterial products from these sources act similarly to mallein in giving large local reactions in certain immune horses. There appeared to be no connection between the reaction and the interval of time since the last injection received by the horse in the course of immunization.

Opportunity was had to test the effect of repeated doses of mallein. In this experiment the conclusion was reached that a glanderous horse may be injected with mallein within a few days after the first injection and still give a reaction, even when the dose is not increased in size. Healthy horses may give increasing reactions upon repeating the dose at short intervals from 4 to 5 times, but the reactions resemble those obtained in immune horses rather than those upon glanderous animals. No temperature reaction was obtained in either glanderous or healthy horses after the second dose of mallein.

The authors find that many horses immunized against other bacteria or bacterial products may give a large local reaction to mallein, but that this reaction is not associated with a rise in temperature, and disappears more rapidly than in a typical mallein reaction.

Barium, a cause of the loco-weed disease, A. C. Crawford (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 129, pp. 9–87*).—An account is given of the distribution of the loco weeds, symptoms of the disease, and an extended historical sketch of loco investigation with references to the literature. It is stated that condi-

tions analogous to those met with in locoed animals occur in other portions of the world, especially Australia.

Experiments with rabbits and sheep were carried on. It was found that the main symptoms described in stock on the range can be reproduced in rabbits by feeding extracts from the loco plants *Astragalus mollissimus* and *Aragallus lamberti*. Inorganic constituents, especially barium, are held to be responsible for this action, at least in the plants collected at Hugo, Colo., though it is suggested that in other portions of the country other poisonous principles may yet be found. Barium acetate was fed to rabbits, the results indicating that small doses of barium salts may be administered to rabbits without apparent effect, but that suddenly acute symptoms set in analogous to what is reported on the range.

"Loco plants grown on certain soils are inactive pharmacologically and contain no barium. In drying certain loco plants the barium apparently is rendered insoluble so that it is not extracted by water, but can usually be extracted by digestion with the digestive ferments. The barium to be harmful must be in such a form as to be dissolved out by digestion.

"In deciding whether plants are poisonous it is desirable not merely to test the aqueous or alcoholic extract, but also the extracts obtained by digesting these plants with the ferments which occur in the gastro-intestinal tract.

"It is important that the ash of plants, especially those grown on uncultivated soil, as on our unirrigated plains, be examined for various metals, using methods similar to those by which rocks are now analyzed in the laboratory of the United States Geological Survey.

"It is desirable to study various obscure chronic conditions, such as lathyrism, with a view to determine the inorganic constituents of lathyrus and other families of plants."

At present it seems best to rely on preventive measures rather than on antidotal treatment.

The diagnosis of rabies, Anna W. Williams (*Amer. Jour. Pub. Hyg., 18 (1908), No. 1, pp. 10–15*).—The smear method for the diagnosis of rabies was used in 487 cases, of which 260 were obtained from the street and 227 were experimental. Of the 260 street cases 185 showed typical Negri bodies. In the laboratory work carried on by the author no brains were virulent in which Negri bodies could not be discovered. Other investigators, however, have reported the determination of virulence in nerve material not showing Negri bodies and it therefore appears to be still necessary to make animal inoculations in order to be sure of the diagnosis.

The histological diagnosis of rabies, V. Babes (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 6, pp. 284–286*).—In diagnosing rabies in dead dogs the author prefers to examine the medulla rather than the hippocampus, for the reason that the former is more easily dissected out. Rabid lesions are more easily recognized than Negri corpuscles and the author prefers to depend upon the former in making a rapid diagnosis of the disease.

Penetration of the toxin and antitoxin of tetanus through the mucous membrane of the large intestine, M. Breton, G. Petit, and H. Vincent (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 4, pp. 160–163*).—It was found that tetanus toxin is so modified or destroyed in large part by the bacterial flora of the rectum that only a minute quantity passes through the mucous membrane of this organ. On the other hand, the antitoxin of tetanus readily penetrates through the mucous membrane of the large intestine. It is also maintained that the intestinal juices are decidedly antitoxic in their effect upon tetanus toxin.

Investigations on the development of trypanosomes in tsetse flies and other diptera, E. A. Minchin (*Quart. Jour. Micros. Sci. [London], n. ser., 52 (1908), No. 206, pp. 159–260, pls. 6, figs. 2*).—In the experiments reported by the author attention was given particularly to the natural transmission of sleeping sickness. The only point of interest to the veterinarian concerns the development of trypanosomes in tsetse flies. The trypanosomes were found to begin but not to complete their developmental cycle in the tsetse fly or other biting insets. It is suggested that the life cycles of different trypanosomes may not all follow the same course.

Baleri, a trypanosomiasis affecting animals along the Nile, G. Bouffard (*Ann. Inst. Pasteur, 22 (1908), No. 1, pp. 1–25*).—Baleri is a trypanosomiasis which affects horses, asses, and dogs, and is due to infection with *Trypanosoma pecaudi*. It is widely distributed along the bend of the Nile. Since this disease is transmitted by tsetse flies the question arises whether it is possible to exterminate these insects. *Glossina palpalis* in the region in question occurs only along those parts of the river where the banks are abundantly overgrown with vegetation and brush.. While the removal of this material would be a serious undertaking it is regarded as practicable.

Studies on tuberculosis (*Arch. Path. Anat. u. Physiol. [Virchow], 190 (1907), Beiheft, pp. 544, pls. 29, figs. 3*).—Immunization of warm-blooded animals against tuberculosis by means of the tubercle bacilli of cold-blooded animals is discussed upon a historical and experimental basis, by J. Orth and Lydia Rabinowitsch (pp. 1–58). It was found that injections of tubercle bacilli from cold-blooded animals were not always harmless to warm-blooded animals and that the immunity thus produced was of little value. A more or less generalized infection took place in some cases, the development of the disease being slow.

H. Beitzke gives a report on experiments and observations in the infection of man with bovine tuberculosis. In an examination of 25 generalized cases of tuberculosis in children, 2, or 8 per cent, were found to be due to the bovine tubercle bacillus. There appear to be a number of transition stages in tubercle bacilli lying on the border line of one or the other of the two main types or between the characteristics of these types. Such atypical human tubercle bacilli may be transformed into typical bovine tubercle bacilli by inoculation into cattle.

E. Klebs discusses in detail the problem of immunization against tuberculosis (pp. 134–195). In attempts to produce immunity in experimental animals by inoculation with tubercle bacilli of low virulence it was found that the weak infection thus produced might entirely disappear, together with all trace of tubercle bacilli. Similar results, however, may ultimately come about from natural infection, for it is occasionally observed that experimental animals inoculated by inhalation of tubercle bacilli ultimately become entirely free from tuberculosis by healing of tuberculous lesions through the natural resisting powers of the animal body. Some beneficial results are also reported from the use of a product called tubercle-sozin, which is said to contain the active principles of the tubercle bacillus without any toxin.

Spontaneous tuberculosis in monkeys was studied by Lydia Rabinowitsch (pp. 196–245). Experiments were made with a considerable variety of apes, using human tubercle bacilli. In nearly all cases the human tubercle bacilli produced typical tuberculous lesions of a generalized character.

M. Koch and Lydia Rabinowitsch give an extended report on their studies of the relationship between avian and mammalian tuberculosis (pp. 246–541). In the course of this study the authors came to the conclusion that mammalian and avian tubercle bacilli are not distinct species but are varieties of a single species adapted to the two groups of the animal kingdom. Avian tuberculosis in general

is characterized by lesions of the abdominal viscera. Infection ordinarily takes place by means of the alimentary tract and the lesions are notable for the extraordinary number of bacteria which they contain. Quite serious and extensive infections were produced in guinea pigs, rabbits, mice, and even in cattle and goats by means of inoculation with avian tubercle bacilli.

The present status of the question regarding the relationship between human and animal tuberculosis, Dammann (*Deut. Tierärztl. Wchnschr., 16 (1908), No. 6, pp. 77–82*).—The two fairly distinct types of tubercle bacilli which have been commonly referred to as bovine and human have been more and more connected in recent years by the finding of a number of intermediate forms which can not be readily classified with either type. The results of recent investigations are unfavorable to the assumption of specific difference between these types.

The chemical constitution and biological properties of the protoplasm of the tubercle bacillus, J. Auclair and L. Paris (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 6, pp. 301–303*).—Of the substances thus far obtained from the tubercle bacillus, tuberculin exercises a general effect, while the fat substance of the bacillus is local in its effects. By means of fractional extraction the authors isolated a form of casein which is believed to be the chief cause of the formation of the tubercle in the progress of tuberculosis.

Intestinal tuberculosis in calves kept in infected stables, A. Ceradini and A. Fiorentini (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), No. 2, pp. 104–108*).—The purpose of the experiments reported in this paper was to determine the susceptibility of young calves to tuberculous infection in stables which were known to be infected with this disease. It was found that tuberculosis in sucking calves occurs only exceptionally. In adult cattle the disease appears more frequently as a result of exposure in infected stables. The mesenteric glands of adult cattle may contain virulent tubercle bacilli without showing visible alterations. These glands are very effective in catching tubercle bacilli and other organisms, particularly those of infectious pneumoenteritis in calves.

Clinical diagnosis of tuberculosis of the peritoneum and abdominal lymph glands by means of rectal examination, Storch (*Berlin. Tierärztl. Wchnschr., 1908, No. 8, pp. 141–143*).—Attention is called to the fact that serious cases of tuberculosis of the peritoneum may exist without showing recognizable external symptoms. The author has tested the value of rectal examination in such cases and finds it possible to palpate the tuberculous lesions upon the peritoneum or the tuberculous lymph glands and thus to reach a diagnosis.

Tuberculosis in dairy cows, with special reference to the udder and the tuberculin test, A. Wilson (*Vet. Rec., 20 (1908), No. 1024, pp. 591–596*).—A general account is presented of the nature of tuberculin, the temperature reactions observed in making the tuberculin test, and the importance of this test in putting into practice any scheme for the eradication of tuberculosis. Statistics were collected and are presented in a summarized form regarding the source of tubercle bacilli in milk and the percentage of tuberculous udders in cows.

The absorption of tuberculin by the rectum, A. Calmette and M. Breton (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 4, pp. 163–165*).—In tuberculous rabbits and guinea pigs it was found that intrarectal injection of tuberculin produced the same effects as subcutaneous injection. In healthy rabbits and guinea pigs a single intrarectal injection of large doses or of repeated small doses of tuberculin produces a gradual intoxication which nearly always ends fatally.

Tuberculin, H. E. Reeser (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), Nos. 1, pp. 56–67; 2, pp. 149–167*).—In most cases a reaction may be obtained from an injection of tuberculin made only a few days after a previous injection. The

dose need not be increased in order to obtain the reaction. The reaction to the second dose of tuberculin, however, is not constant and the reason for the irregularity observed in such cases is not well understood. As a rule, the second reaction appears more promptly than the first and is somewhat less intense.

With regard to the temperature reaction from tuberculin it appears impossible to fix a minimum under which we may know with certainty that tuberculosis does not exist. In general a temperature of at least 40° C. in animals which showed a maximum of 39.5° C. before injection may be relied upon as indicating the presence of tuberculosis.

Ophthalmo-tuberculin reaction in cattle, E. F. McCampbell and D. S. White (*Jour. Expt. Med., 10 (1908), No. 2, pp. 232–237*).—Tests of the ophthalmo-tuberculin reaction carried out by the authors on cattle indicate that this method is of some value for diagnostic purposes. A characteristic conjunctivitis appears within 6 or 8 hours in tuberculous animals, disappearing after 48 hours. The reaction is more pronounced in cattle which have not been recently tested with tuberculin, but is only slightly reduced in intensity as a result of a previous subcutaneous injection.

Administration of the tuberculin test by stable helpers, A. Van Leeuwen (*Tijdschr. Vecartsenijk., 35 (1908), No. 5, pp. 269–276*).—In the opinion of the author the ordinary attendants about cattle barns are not capable of giving the tuberculin test in a satisfactory way. It is recommended that the test be applied only by qualified veterinarians.

Dangers from the use of tuberculous animal products. Treatment of tuberculosis with strychnin, V. Galtier (*Jour. Méd. Vét. et Zootech., 58 (1907), Dec., pp. 705–712*).—Feeding experiments with the meat of tuberculous animals indicated that this material ordinarily does not contain tubercle bacilli. It is recommended, however, that such meat should always be sterilized by thorough cooking before being used as human food.

Somewhat beneficial effects were observed in experimental tuberculosis as a result of treatment with arsenic or iodid of sodium combined with strychnin or by the use of strychnin alone. Strychnin appeared to increase the resistance of the animal to tuberculosis, to prevent to some degree the generalization of the disease, and to lead to a more hasty healing of lesions.

Chronic pseudotuberculosis in Norway, H. Horne (*Norsk Vet. Tidsskr., 20 (1908), No. 3, pp. 72–77, fig. 1*).—Pseudotuberculous enteritis, or Johne's disease, occurs quite frequently in Norway. The lesions produced in the alimentary tract are described. The author believes that this disease has not been shown to be identical with tuberculosis.

Protective vaccination of cattle against hemoglobinuria, Bugge (*Berlin. Tierärztl. Wchnschr., 1908, No. 6, pp. 95, 96*).—Among 138 cattle vaccinated against hemoglobinuria, 7 subsequently became affected with the disease and 2 died. It is believed that the vaccine used in these cases was somewhat too virulent. The suggestion is therefore made that in future experiments along this line a vaccine be used of lower virulence or in smaller doses.

Bacilliform piroplasmosis of cattle in Algeria, H. Soulié and G. Roig (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 4, pp. 192, 193*).—A piroplasmosis occurs in Algeria under two or three forms, the symptoms of which forms are described by the authors. It is not certain whether the bacilliform piroplasmosis thus identified is an atypical form of Texas fever or a distinct disease.

Post-partum paralysis of cows, A. Zehl (*Berlin. Tierärztl. Wchnschr., 1908, No. 7, pp. 117–121*).—Not all cases in which cows are unable to rise after parturition are to be classified as parturient paresis. The symptoms, however, are strikingly similar in most respects and cases of either disease are readily cured by infusion of air into the udder.

Cattle quarantine law in Nebraska, G. W. Hervey (*Twentieth Cent. Farmer, 1908, No. 376, pp. 6, 7*).—Cattle mange has persisted in western Nebraska for more than 15 years and ranchmen have, for some time, made regular dippings of stock for curative and preventive purposes. The present cattle quarantine law of Nebraska is considered defective, for though it appears to be quite rigid there is no adequate provision for enforcing its various features. For this reason, Federal aid is believed to be required in the control of cattle mange.

Construction of cattle dips, P. Cowley (*Agr. Gaz. N. S. Wales, 18 (1907), No. 9, pp. 756–761, pl. 1*).—Detailed directions are given for the construction of dipping vats of brick and concrete. Cement draining yards and settling tanks are also included in the specifications.

Bovine bilharziosis in France, G. Marotel (*Bul. Soc. Cent. Méd. Vét., 85 (1908), No. 4, pp. 119–122, figs. 2*).—The occurrence of *Schistosomum bomfordi* is reported in cattle in France. A detailed description is given of the anatomy of this worm.

Schistosomum bovis and the alterations produced by it, G. Bertolini (*Clin. Vet. [Milan], Sez. Sci., 31 (1908), No. 1, pp. 1–64, pls. 3*).—*Schistosomum bovis* in the cattle examined by the author occurs in about 9 per cent of cases. The adult parasites are found in largest numbers in the portal circulation, especially in the ramifications of this system in the liver. The location of the parasites, however, varies greatly in different cases. Eggs are laid chiefly in the small intestines but also to some extent in the large intestines. In the small intestines the effect of parasitism include catarrhal enteritis and the formation of nodules under the mucous membrane.

Sheep scab, E. L. Moore (*South Dakota Sta. Bul. 107, pp. 355–382, figs. 4*).—This bulletin gives an account of the forms and symptoms of the disease, the biology of the mites producing it, manner of transmission, remedies, and Federal and State regulations to prevent the spread of scabies in sheep.

The use of communal funds in organizing a system of vaccination against swine erysipelas, Bartels (*Deut. Tierärztl. Wchnschr., 16 (1908), No. 7, pp. 93, 94*).—The authors had occasion to test the feasibility of using district communal funds for defraying the expense of vaccination for swine erysipelas. It is recommended that where this plan is adopted, vaccination should not be carried out in communities in which swine erysipelas rarely occurs but only in the permanently infected localities.

Hog cholera, Carré, E. Leclainche, and H. Vallée (*Rev. Gén. Méd. Vét., 11 (1908), No. 125, pp. 241–246*).—A study of hog cholera in France has convinced the authors that the disease in that country as in the United States, England, and Germany is due to a filterable virus and not to the hog-cholera bacillus.

The possibility of utilizing the horse for the production of an immune serum against hog cholera, W. Koops (*Berlin. Tierärztl. Wchnschr., 1908, No. 7, p. 117*).—Difficulties were experienced in obtaining an immune serum against hog cholera from hogs and resort was therefore had to the horse for this purpose. It was soon found, however, that the resistance of the horse could not be raised sufficiently high for the reason that these animals soon showed a supersensitiveness to hog serum. In order to avoid this trouble a method of precipitation was devised by means of which the red blood corpuscles and protein are extracted from the blood before using the material for the hyperimmunization of horses. Further experiments will be required before it is known how effective a serum can be obtained from horses thus treated.

The horse; its treatment in health and disease, J. W. Axe (*London [1907], vol. 9, pp. X+413–610, pls. 12, figs. 47*).—In this volume the author continues the discussion of warranty of soundness of condition of horses at the time of

sale. The general principles of horseshoeing are presented in connection with a description of the anatomy and physiology of the foot, preparation of the feet for shoeing, the various kinds of shoes, and the possible injuries from defective shoeing. The problems connected with the transportation of horses by sea and land are also discussed. Considerable attention is given to the geological and recent history of the horse and related species.

A glossary of technical terms is appended to the volume and also a general index of the nine volumes.

The Borna horse disease, H. Raebiger (*Landw. Wchnschr. Sachsen, 10 (1908), No. 8, pp. 75, 76*).—The so-called Borna horse disease persists in various localities of Saxony. The means suggested by the author for controlling the disease include a sanitary supervision of the water and food and better care of the horses.

Etiology of infectious pneumonia of horses, E. Tabusso (*Rev. Gén. Méd. Vét., 11 (1908), No. 124, pp. 177–186*).—In four cases of infectious pneumonia in horses the author found *Pasteurella equi* to be the pathogenic organism. It is not maintained, however, that this is the only organism which may produce an infectious pneumonia in horses.

The treatment of foal lameness, Beck (*Wchnschr. Tierheilk. u. Viehzucht, 52 (1908), No. 8, pp. 145–147*).—The administration of iodid of potash directly to young colts affected with lameness of bacterial origin was unsatisfactory. Far better results, however, were obtained from the indirect use of the drug by giving it to the mares. The milk then contains a sufficient quantity of iodid of potash to bring about satisfactory results in the majority of cases. In 14 cases thus treated 12 recovered entirely. The umbilical cord was treated with an antiseptic solution in all of these cases. In 6 other cases in which no attention was given to the umbilical cord but in which the mares received the iodid of potash in doses of 10 gm. daily, 5 of the colts recovered after a few days.

Experimental leukemia in fowls, V. Ellermann and O. Bang (*Centbl. Bakt. [etc.]. 1. Abt., Orig., 46 (1908), No. 1, pp. 4, 5*).—Much difference of opinion has prevailed regarding the nature of leukemia in animals and man. The authors had occasion to carry on some experiments with this disease in fowls. It was found that during the progress of leukemia, the number of leucocytes may be half as great as that of the red blood corpuscles. True leukemia in contrast with so-called infectious leukemia runs a chronic course. The modification of the formula for the blood elements is not due merely to an increase of the white corpuscles in general. The mononuclear forms are greatly increased in numbers while the polynuclear leucocytes are present in relatively diminished numbers. If healthy fowls are inoculated intravenously with an organic emulsion containing these leucocytes a typical case of leukemia is produced within 3 months. The authors are disposed to believe that leukemia will prove to be infectious but the organism has not yet been determined.

Avian diphtheria and contagious epithelioma, V. Fally (*Ann. Méd. Vét., 57 (1908), No. 2, pp. 69–75*).—In the experiments reported in this paper the author attempted to reach a differential diagnosis between these diseases or to obtain evidence as to their identity or dual nature. It is admitted that a fowl may have both diseases at the same time but that recovery from roup does not protect the fowl against epithelioma or vice versa. The author believes, therefore, that the two diseases are distinct.

The parasitic amebæ of the intestinal tract of man and other animals, E. L. Walker (*Jour. Med. Research, 17 (1908), No. 4, pp. 379–459, pls. 4*).—An elaborate review is given of the development of our knowledge regarding parasitic amebæ. The author also discusses methods of cultivation of amebæ,

the reproductive processes which occur in the genus, the nomenclature and the biology of these forms. Detailed descriptions are presented of 38 species of parasitic amebæ which have been found in animals and man. A bibliography relating to the subject is also given.

RURAL ENGINEERING.

Progress report on irrigation experiments in Willamette Valley, Oregon, A. P. Stover (*U. S. Dept. Agr., Office Expt. Stas. Circ. 78, pp. 25, figs. 7*).—This circular describes experiments in irrigation in the Willamette Valley and gives tentative results of the first season's work. While this valley has a rainfall of approximately 44 in. per annum, that which occurs during the summer months is very small, the average for the three months' period from the middle of June to the middle of September being only about 2½ in. This valley has been under cultivation for more than half a century and has been a great wheat-growing region, this crop maturing before the summer drought, but the land has ceased to produce profitable crops of wheat and diversification has become necessary. In order that the crops may be grown throughout the dry summer irrigation is required and the experiments undertaken are for the purpose of determining methods, cost, and returns. The returns reported from the single season indicate large profits from the use of water during the summer months.

The use of small water supplies for irrigation, S. Fortier (*U. S. Dept. Agr. Yearbook 1907, pp. 409–424, figs. 6*).—"From an agricultural standpoint the greatest need of the arid and semiarid regions is a larger water supply. Out of a total of about 900,000,000 acres less than 1⅛ per cent is artificially watered. When all of the available water supplies are utilized it is doubtful if more than 7 or 8 per cent of the total area can be irrigated." The importance of utilizing every available source of water for irrigation is, therefore, evident. This article calls attention to the possibilities of developing small water supplies and shows the methods of using them to the best advantage. It describes typical plants for storing water from springs, and for pumping water from wells by windmills, engines, and electric motors. Methods of construction and cost of plants, methods of using water and returns from the lands are given.

Irrigation with household waste water, H. Selkirk (*Agr. Gaz. N. S. Wales, 19 (1908), No. 3, pp. 223, 224, fig. 1*).—A simple system of pipes and drains for utilizing the house sewage in irrigating vegetables and fruit trees and the benefits derived from such irrigation are briefly described.

Drainage in New York, E. O. Fippin (*New York Cornell Sta. Bul. 254, pp. 391–428, figs. 29*).—The large area in New York requiring drainage includes the marsh or swamp land and the heavy clay soils. The marshes, scattered throughout the State in irregular areas but extensive in the aggregate, are practically useless for agricultural purposes without drainage. The heavy clay soils are in cultivation but their crop value has been greatly reduced by the loss of vegetable matter in the soil, followed by pronounced physical changes whereby the soil has become harder and more compact, the rainfall moving over the land rather than through it, and the subsequent rapid drying causing it to become dense and impervious. These physical changes have given rise to extremes of wetness and drought. Such soil can be reclaimed only by drainage and better methods of cultivation, and thorough tile drainage is recommended as the best means of reclamation.

A brief account is given of the first tile drains used in America, these being laid near Geneva by John Johnston in 1837. The effects of tile drainage and the benefits that accrue to the soil are set forth.

A discussion is given of the practical details of tile drainage, showing how the work should be planned to meet different conditions, and describing the instruments used in laying out the systems and the tools and methods employed in digging the ditches and laying the tile. The use of machines for digging tile ditches is considered, with data as to the relative cost of machine and hand labor. Tables are given showing the number and size of tile required to drain a given area under specific conditions and also the cost of the various sizes of tile in common use.

The value of open ditches and the efficiency of stone drains, such as are used in some parts of the State, are discussed. An appendix presents an abstract of the New York law relative to agricultural drainage and a list of tile manufacturers in the State.

Dust preventives, L. W. PAGE (*U. S. Dept. Agr. Yearbook 1907, pp. 257–266, pls. 4*).—A discussion of the problem of preservation of road surfaces under automobile traffic and of the use of dust preventives, with an account of the results obtained from the use of mineral oils, coal tar, sea water, magnesium chlorid, sodium chlorid, water-gas tar, and a number of proprietary emulsions.

It is stated that up to the present time no method of building an economical dust-proof country road has been devised. As to the relative values of different substances for the treatment of existing roads, "in certain localities the use of one of these materials is often claimed to be more satisfactory than others. Whether this is due to skill in treatment or to local physical conditions, it is impossible at present to say. In estimating the relative cost of dust prevention by various materials, it must be borne in mind that any substance which prevents the formation of dust, and holds that already formed on a road surface, greatly lengthens the life of a road and consequently lowers the cost of maintenance. This precludes the obtaining of accurate cost data at present, as it can only be had after a sufficient length of time has elapsed to determine the saving in repairs to the road from the use of dust preventives. The entire subject is still in an experimental stage, and where a community wishes to have work of this kind carried on, the advice of some experienced person, familiar not only with one preparation but with many, should be sought in order to avoid costly mistakes and the repetition of failures made in other places."

The effect of alkali on Portland cement, E. T. TANNATT and E. BURKE (*Montana Sta. Bul. 69, pp. 93–120, pls. 5, figs. 4*).—Examinations of cement structures, particularly sewers at Great Falls, Mont., which had been disintegrated by the action of alkali, are reported and discussed in this bulletin.

"Just how the alkali in the soil acts upon the cement is a matter for investigation. It is possible that the action is similar to the action of the salts in sea water . . . or it may be that the cements behave in a manner similar to the soils containing zeolites. Zeolites being hydro-silicates contain as bases chiefly lime and alumina with some potash and soda, which have the power of absorbing alkali salts and exchanging bases with them."

The authors conclude from the investigations that the use of cement construction for sewers is inadvisable in alkali soils unless it is possible to drain all ground water from the exterior of the sewer. Sandstone and concrete foundations for buildings are subject to the same objections.

Conditions affecting the production of denatured alcohol in the Northwest, J. S. JONES (*Idaho Sta. Bul. 60, pp. 3–21*).—A popular discussion is given of the present situation in the Northwest, with excerpts from the Federal laws relating to the production of denatured alcohol, an exposition of some of the regulations of the Commissioner of Internal Revenue, and data as to the efficiency of denatured alcohol for light, heat, and power. Although no denatured alcohol

is now produced in the Northwest and its general use is prohibited by the high price ($1 per gallon) at which it is sold, and by the lack of suitable burners, engines, and other appliances, the author believes that it will eventually become an active competitor of gasoline in the region, and that special farm crops will be grown for its production for local use.

RURAL ECONOMICS.

Land reform: Occupying ownership, peasant proprietary, and rural education, J. COLLINGS (*London, 1908, pp. XXIX+452*).—This book is a history of the land-tenure system of England. It proposes as a remedy for rural depopulation, scarcity of trained farm labor, the pauper system, the unemployed in cities, and other rural, economic, and social problems, "a measure of land reform based on the principle of occupying ownership," the creation of a peasant proprietary, and a system of agricultural education that will initiate the children in rural subjects during the most impressionable period of their lives. If this policy could be carried out the author believes "it gives some hope of a remedy for the present deplorable condition of rural life in England."

The agrarian problem in England, G. LECARPENTIER (*Rev. Écon. Internat., 5 (1908), II, No. 2, pp. 403–417*).—This is a historical review of the agricultural land problem in England, including a discussion of the land-tenure system, the inclosure acts relating to common fields, and their effects on rural depopulation. Particular attention is given to the Small Holdings Act of 1907, which is held to correct the defects of a similar act passed by Parliament in 1892. The benefits of the new law relate to the government's interest in making it easier for the small farmer to acquire land and the necessary capital to exploit it.

The farm labor of rural England, F. RYZIGER (*Ann. Gembloux, 18 (1908), No. 7, pp. 403–431*).—The author by personal inquiry and a study of the literature on the subject sets forth in this article a review of the conditions which have brought about rural depopulation in England and considers the governmental and other proposed remedies to counteract the movement toward the cities.

To improve rural labor conditions in England the author believes (1) that information should be procured and presented to farm laborers comparing the actual wage conditions of city and farm laborers, the advantage being easily shown to be with the latter, (2) that farm laborers be given practical instruction especially relating to the advantages offered in rural life, and (3) that they then be left to develop naturally the power of individual initiative.

The farmer and the laborer, T. P. GILL (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), Nos. 3, pp. 409–422; 4, pp. 635–650*).—These are two addresses delivered before societies of farmers and farm laborers of County Tipperary in February and May, 1908.

The author discusses the existing relations between these classes in Ireland and points out some ways in which improvement could be effected. Among these are mentioned the development of intensive culture, the more regular employment of labor, the raising of first-class dairy, poultry, and other products, the recognition of merit in farm hands by better remuneration, the development of cooperation and mutual credit banks, improvement in the farm laborer's dietary, more efficient training for laborers, a better system of education, and fair facilities for the provident farm laborer to acquire a farm of his own.

Report of the Irish Agricultural Organization Society, Limited, N. T. EVERARD and R. A. ANDERSON (*Rpt. Irish Agr. Organ. Soc., 1907, pp. 79, map 1*).—Detailed statistical data with discussion of the work of the affiliated agricultural cooperative and credit societies for the year ended June 30, 1907. On December

31, 1906, the societies numbered 873, a net gain of 38, and had conducted a business exceeding £2,000,000 during the year. Of this number the cooperative creameries and branches numbered 340 and the mutual credit societies 246.

An uplifting negro cooperative society, R. L. SMITH (*World's Work, 16 (1908), No. 3, pp. 10462–10466*).—This is an account of the development of the Farmers' Improvement Society of Texas from 1890 to 1907, and of the economic and social improvement brought about among negro farmers by means of this cooperative organization which was fostered by the author. From a state of general poverty among farmers due to the prevailing credit system, the society has established a class of negro farmers who are self-reliant, progressive, and property owners. The returns to October, 1907, are as follows: Number of groups 475, with 9,256 members; acres owned by members 71,439, valued at $1,071,585; value of live stock owned by members $275,000; and value of improvements made during the year ended October, 1907, $58,148.

Jews as farmers (*Amer. Cult., 70 (1908), No. 28, p. 2*).—It is estimated that about 5,000 Jews are engaged in agriculture in the United States, and the farm colonies started in many parts of the country, particularly in New Jersey, are briefly described. The Jewish Agricultural Society of New York received 1,345 applications in 1907 from Jews wishing to engage in agriculture and since its organization has assisted 764 farmers in 19 States with loans aggregating nearly $500,000. About one-fourth of this amount has already been repaid, and the farmers assisted now own property with a valuation of about $1,250,000.

Agricultural colonies in Palestine (*Economist, 66 (1908), No. 3380, pp. 1189, 1190*).—This article describes the revival of agriculture in Palestine, largely by Jewish colonists from Russia and Roumania, who have adopted modern implements and methods of culture. The crops raised are oranges, olives, almonds, grapes, and cereal crops, the bulk of which is exported, chiefly to England.

The internal colonization of Prussia and its application to the agrarian problem in Mexico, H. J. LUDEWIG (*Bol. Soc. Fomento [Mexico], 7 (1908), No. 6, pp. 7–83, map 1*).—This bulletin discusses the causes of rural depopulation which took place in Prussia during the last part of the nineteenth century, gives the results of the work of the colonization commission in the establishment of small farms which in 20 years amounted to 18,870, with houses accommodating 75,500 occupants, and points out in what ways such a commission would be helpful to native and immigrant farm laborers in Mexico.

[The relation of the government to agriculture in Russia], TORNE (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 5, pp. 592–601*).—The author describes the methods of securing and publishing agricultural statistics in Russia, the government measures for encouraging the exportation of agricultural products and assisting the industry as a whole, the territorial, administrative, and communal organization of the rural population, and the establishment of schools for the teaching of agriculture.

The assistance rendered by the government to the agricultural population consists in aiding colonists by advancing money, seed, instruments, lumber, and other forms of capital, in encouraging the peasants to become landowners, and in so redividing and reassigning the communal lands as to assign to each peasant a single piece of land equal in extent to the many separate parcels formerly held by individuals or families under the old communal system of land tenure.

State aid to agriculture in foreign and colonial countries, W. E. BEAR (*Trans. Highland and Agr. Soc. Scot., 5. ser., 20 (1908), pp. 1–36*).—The amount of money expended by various governments for different lines of work relating to agriculture are tabulated and discussed.

Some computed returns of farms in Switzerland (*Landw. Ztschr. Rheinprovinz, 9 (1908), No. 24, pp. 329, 330*).—This article is summarized from a report by Dr. E. Laur on the returns from 916 different-size farms in Switzerland for the years 1901–1906, inclusive. The statistics are believed to indicate that intensive rather than extensive farming gives the better returns. A judicious combination of different branches of farming, with about 50 per cent of the land, labor, and capital devoted to dairying, is believed to offer the best prospects to farmers in Switzerland.

Agriculture in Siam, Dilock (*Die Landwirtschaft in Siam. Leipsic, 1908, pp. 215*).—This book describes the conditions of agriculture in Siam and is a contribution to the economic history of the kingdom from the agricultural point of view.

Traffic on Chesapeake Bay and Tennessee River, F. Andrews (*U. S. Dept. Agr. Yearbook 1907, pp. 289–304*).—This article discusses the advantages and disadvantages of water transportation of agricultural products, the Chesapeake Bay and Tennessee River traffic being taken as typical of the methods of handling crops. The amount and kind of crops shipped, and the freight rates for water transportation as compared with rates on railroads competing in these regions, are discussed. Freight rates by water transportation are shown to be very much lower than railroad rates, but certain kinds of truck and fruit crops are better and more quickly handled by the railroads. The possibility of improving the methods of loading and unloading agricultural freight carried by steamboats, the need of longer and more regular seasons of navigation, and the importance of making the channels of rivers more navigable for the regular movement of farm produce are particularly emphasized.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 9, pp. 65–72*).—Notes are given on the crop conditions in the United States and foreign countries, with statistics of the farm values and prices of agricultural products and the principal groups of farm and forest products imported into the United States during the years ended June 30, 1907 and 1908.

AGRICULTURAL EDUCATION.

Education [agricultural] (*Encyclopædia of Agriculture. Edinburgh and London, 1908, vol. 2, pp. 9–18*).—Contains a rather full discussion of agricultural education in the British Islands, beginning with the first attempt to institute systematic instruction in the theory and science of agriculture in 1790, when a chair of agriculture was established in the University of Edinburgh. In Ireland the first state-supported school of agriculture was established in 1838, and in England the first agricultural college was founded at Cirencester in 1845. The development and present status of agricultural education in England, Ireland, and Scotland, and the part taken by state and local governments in this educational work are described.

The New York State Agricultural College at Ovid, N. Y., and higher agricultural education, D. Willers (*Varick, N. Y., 1907, pp. 27, pl. 1*).—A historical paper containing data concerning the act of the New York State legislature incorporating the New York State Agricultural College, which was first located at Fayette in Seneca County, and later at Ovid, and subsequent acts relating to Cornell University and the funds derived from the several acts of Congress in aid of agricultural education.

It appears that the New York State Agricultural College at Ovid was opened for the reception of students December 5, 1860, when a class of 27 young men

entered the institution, and was closed in the spring of 1862. Dr. William H. Brewer was appointed professor of agricultural chemistry, but resigned before the college was opened.

Training courses for teachers of agriculture, D. J. Crosby (*U. S. Dept. Agr. Yearbook 1907, pp. 207–220*).—The results are set forth of an inquiry conducted by this Office concerning courses for teachers of agriculture, in agricultural colleges, State normal schools, privately endowed colleges and schools, and county normal training schools in the United States, together with a discussion of the essentials of training for teachers of agriculture and lines of future development in this work.

Course in cereal foods and their preparation for movable schools of agriculture, Margaret J. Mitchell (*U. S. Dept. Agr., Office Expt. Stas. Bul. 200, pp. 11–78*).—This bulletin contains a syllabus of a course of 15 lectures covering quite fully the use, preparation and nutritive value of cereal foods. The subjects of the lectures are as follows: The composition of vegetable foods; composition of the body and the uses of food compounds in the body; digestion, assimilation, excretion; a study of starch; cereals used as breakfast foods; cereals which are used as vegetables; bread; yeast and molds; a study of wheat flour; a study of rye, corn, buckwheat, and other flours; changes produced in the constituents of bread; cost of bread, causes of imperfections, fancy breads; bread raised by other agents than yeast; cooking in deep fat; and dough raised with eggs, and icing for cake. Each lecture is accompanied by suggestions for practical work and experiments. An appendix contains references to literature and a list of apparatus and materials needed.

Agriculture, industries, and home economics in our public schools, W. M. Hays (*Chicago, 1908, pp. 37, figs. 37*).—An address delivered before the department of superintendence of the National Education Association, in Washington, D. C., February 25, 1908. The paper is profusely illustrated with half-tones, maps, and diagrams showing features of industrial education in secondary schools, the distribution of land-grant colleges and State normal schools, schemes for districting States for secondary agricultural schools, and plans of school buildings and grounds.

A course of study in agriculture for the public schools; what it should be and how to teach it, B. Youngblood (*Okla. School Herald, 16 (1908), No. 4, pp. 17, 18*).—This deals more especially with suggestions for practice work and excursions.

The Weather Bureau and the public schools, J. R. Weeks (*U. S. Dept. Agr. Yearbook 1907, pp. 267–276, figs. 3*).—The author describes some features of public school instruction relating to the weather, particularly in the elementary schools of New York State, discusses the purpose and value of the study of meteorology in schools, and describes simple homemade instruments used in making observations.

The school and its grounds, D. A. Clark (*Fruit-Grower, 19 (1908), No. 5, pp. 16, 17, figs. 2, dgm. 1*).—A discussion of the educational and esthetic value of trees, shrubs, and flowers in the vicinity of the schoolhouse, with suggestions for laying out and planting school grounds.

The school garden, II, O. W. Caldwell ([*East. Ill. State*] *Normal School Bul. 20, pp. 35, pls. 10*).—This is a progress report on school gardens begun at the Eastern Illinois State Normal School in 1902, with an interpretation of the value of school gardens in the scheme of instruction. The author speaks of the way the garden is conducted, taking the individual garden and individual ownership as the basis and discussing somewhat the advantages of this plan. He also discusses such matters as keeping up the interest in garden work in

the summer, the garden as a center of natural history work, and the garden as a means for studying agriculture and forestry and bringing about a better organization of the nature-study and natural-history work.

Home nature-study course, Anna B. Comstock and J. W. Spencer (*Home Nature-Study Course [Cornell Univ., State Col. Agr.], n. ser., 4 (1908), No. 4, pp. 28, figs. 11*).—Suggestions for the work of third-year pupils as outlined in the Syllabus of Nature Study and Agriculture issued by the New York State Education Department. Lessons are given on the trillium plant and its habits, the eggs of frogs and toads, tadpoles, a tadpole aquarium, the toad and its habits, the frog, the tree frog, how to make an aquarium, the strawberry plant, and its flowers, fruits, diseases and insect enemies, and blackbirds and their habits.

Agriculture: Its fundamental principles, A. M. Soule and E. H. L. Turpin (*Atlanta, Richmond, and Dallas, 1907, pp. 320, pls. 4, figs. 219*).—This text-book of elementary agriculture is intended for use in the public schools. It deals successively with the soil, its formation and physical characteristics, the plant in its life cycle, soil improvement, and field, orchard, and garden crops and their enemies and friends. One chapter is devoted to domestic animals, including cattle, horses, sheep, goats, hogs, poultry, and bees, and another to miscellaneous topics, such as trees, farm tools, good roads, the help of science, and school gardens. An appendix contains formulas for fertilizers and spraying mixtures, tables of feed and feeding standards, and lists of Farmers' Bulletins and agricultural experiment stations.

MISCELLANEOUS.

Yearbook of the Department of Agriculture, 1907 (*U. S. Dept. Agr. Yearbook 1907, pp. 798, pls. 65, figs. 56*).—The Yearbook for 1907 contains a report of the Secretary on the work of the Department during the year, a brief account by J. A. Arnold of the life and work of the late James Wallace Pinchot, 26 other special articles abstracted elsewhere in this issue, and an appendix consisting of an agricultural directory, a review of weather and crop conditions, the principal injurious insects and plant diseases of the year, progress in food and drug inspection and in forestry, soil areas surveyed and mapped, improvements in farm practice, game protection, bounty laws in force and road laws enacted in 1907, and agricultural statistics.

Annual Report of Idaho Station, 1907 (*Idaho Sta. Rpt. 1907, pp. 46, pls. 2*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1907, a report of the director, and departmental reports, of which that on dry farming and soil moisture investigations is noted on page 214 of this issue.

Fourteenth Annual Report of Montana Station, 1907 (*Montana Sta. Rpt. 1907, pp. 155–185*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1907, a report of the director on the work of the station during the year, lists of station publications, exchanges, donations, and loans, and a meteorological summary of air and soil temperatures, precipitation, wind velocity and direction, sunshine, cloudiness, and frost during 1907.

Encyclopædia of agriculture, edited by C. E. Green and D. Young (*Edinburgh and London, 1908, vol. 2, pp. VII+536, pls. 11, figs. 101*).—This is the second volume of the general encyclopedia of agriculture and contains articles on topics arranged alphabetically from Drills to Joint-ill. An article on agricultural education is abstracted on p. 291 of this issue.

NOTES.

Arkansas University and Station.—W. G. Vincenheller has resigned as dean and director and C. F. Adams, entomologist, has been appointed acting dean and director.

Colorado College and Station.—C. W. Gay, professor of animal husbandry in the Veterinary College of the University of Pennsylvania, has been appointed agriculturist, vice W. L. Carlyle. Alvin Keyser, in charge of soils work at the Nebraska University and Station, has been appointed agronomist, vice W. H. Olin.

Connecticut Storrs Station.—F. R. Thompson, cheese maker in the cooperative experiments with the Dairy Division of this Department, has resigned to engage in commercial work, and has been succeeded by Clinton Grant.

Florida University.—A free correspondence course in agriculture for teachers has been inaugurated, beginning November 1. This course is offered as a result of the recent announcement of the State superintendent of public instruction that in June, 1909, applicants for first and second grade certificates will be required to pass examinations in agriculture. Up to October 27, 70 teachers had enrolled for this course, and applications were coming in at the rate of from 15 to 25 a day.

Georgia College and Station.—J. M. Johnson, professor of agriculture in the college, has accepted the associate editorship of *The Cotton Journal*. Dr. T. H. McHatton has resigned as horticulturist of the station to become adjunct professor in charge of the horticultural department in the college and has been succeeded by H. P. Stuckey, who has been teacher of elementary agriculture in the Winthrop (S. C.) Normal and Industrial College. C. A. McLendon, a 1908 graduate of Clemson College, has been appointed botanist in the station and J. C. Temple, of the North Carolina College and Station, bacteriologist. Beginning January 1, 1909, the station is to undertake dairy extension work in cooperation with the Dairy Division of this Department, with J. H. McClain in charge.

Illinois University and Station.—As a part of the extension work of the College of Agriculture summer courses in agriculture were offered at the Chautauqua assemblies at Streator, Lovington, and Greenfield. A special tent was provided for the exhibition of illustrative material and as an assembly place for farmers and their families. Lectures were given daily and there were frequent demonstrations and trips of observation to nearby farms. At Lovington a woman's course was also offered by the department of household science, tents being erected and furnished as a series of model rooms.

New courses are announced in floriculture and in concrete construction for agricultural purposes.

According to a note in *Science*, James T. Barrett has resigned as assistant in botany in the station to accept a fellowship in botany at Cornell University.

Purdue University.—The second annual fruit show to be held at the university during the week of the farmers' short course, January 11–16, is reported to be arousing great interest among fruit growers of the State.

Iowa College and Station.—M. Mortensen, who has served as instructor during the short courses in dairying for several years, has been appointed acting head of the dairy department, and H. C. Horneman has been appointed extension worker in dairying.

Louisiana University and Stations.—According to a note in *Demeter*, the university has been organized into six colleges, among which are a college of agriculture and the Audubon Sugar School. The agricultural courses have been rearranged to provide additional electives and greater opportunity for specialization. There has also been added a two-year preparatory school of agriculture with A. F. Kidder as principal.

B. F. Hochenedel has resigned as assistant chemist in the Sugar Station to engage in commercial work.

Michigan Station.—A grant to the bacteriological laboratory of $1,500 has been made from state funds for the purpose of manufacturing hog-cholera serum according to the method suggested by the Bureau of Animal Industy of this Department. About 80 liters of serum have been manufactured and 1,819 animals, representing 33 herds, have been treated with a subsequent mortality of about 12 per cent. A charge of 1 ct. per cubic centimeter for virus and 2 cts. per cubic centimeter for serum is made, which covers the cost of production other than that of buildings and permanent equipment.

Mississippi Station.—J. A. McLean, of the Iowa College and Station, has accepted the position of animal husbandman.

Nebraska University and Station.—Martin Nelson has resigned as adjunct professor of field crops in the university and assistant in field crops in the station to accept the position of agriculturist in the Arkansas University and Station. W. W. Burr has been appointed assistant in soils and crops at the North Platte Substation in connection with the coöperative work with the Bureau of Plant Industry of this Department.

Cornell University and Station.—The work of the College of Agriculture in rural economy, hitherto under the immediate direction of the dean as professor of rural economics, has been formally organized as a separate department in charge of G. N. Lauman, who has relinquished his secretaryship to the faculty.

A biological station has been erected in the marshes at the head of Cayuga Lake with water gardens and other facilities for the study of problems in limnology. The research work now under way in this department deals chiefly with the study and development of the forage food of fishes as the beginning of an effort to develop water agriculture.

C. S. Wilson has been appointed assistant professor of pomology, thereby bringing about a further differentiation of the horticultural department, and C. A. Rogers has been appointed assistant professor of poultry husbandry. Other recent appointments include the following: As instructors, E. S. Guthrie, of Ohio State University, in butter making, Milton Pratt Jones, in extension teaching, and George E. Burnap in rural art; as assistants in the College of Agriculture, Lewis J. Cross in agricultural chemistry in its relation to agriculture, Leonard Haseman in entomology, and M. M. McCool and M. F. Barrus in plant pathology; as research assistant, Scott H. Perky in rural economy; as fellow in agriculture, Arthur W. Gilbert in plant breeding; and as assistants in the station, Fred J. Pritchard, Harry H. Love, and Eugene P. Humbert in plant breeding, and J. O. Morgan and Harold J. Conn in soil investigations.

North Carolina College and Station.—Dr. W. A. Syme has been promoted to the assistant professorship of chemistry in the college, and Hubert Hill has been appointed instructor in chemistry. J. K. Plummer has been appointed assistant chemist in the station.

North Carolina State Station.—Hon. Samuel L. Patterson, as State Commissioner of Agriculture chairman of the board of control of the station, and a former member of the governing board of the North Carolina College and College Station, died September 14, aged 58 years.

North Dakota College and Station.—In succession to F. J. Seaver and J. C. McDowell, whose resignations have been previously noted, Herbert F. Bergman, of the Kansas College and Station, has been appointed assistant botanist and R. C. Doneghue, of the Missouri University and Station, assistant agronomist. Dr. H. P. Bassett, assistant chemist, has resigned to engage in commercial work. H. A. Wood, assistant chemist, died October 3.

A severe hailstorm occurred August 29, and although most of the crops on the college and station grounds had been harvested much damage resulted.

A substation has been established at Langdon, where a quarter section of land has been donated for the purpose by the citizens of Cavalier County. Building operations are under way, and it is hoped to begin experimental work in the spring of 1909.

Texas College.—The college cooperated with the Dairy Division of this Department in an extensive dairy exhibit at the recent State fair which attracted much attention. A complete model creamery equipped with separators, pasteurizers, starter cans, ripening vats, churns, and other machinery was in operation daily for the manufacture of butter and ice cream. A class of students from the college gave practical demonstrations in butter making and milk testing, and also competed for prizes in butter making and the judging of dairy cattle.

Vermont University.—Under the provisions of the Nelson amendment a department of teaching has been established, the work of recent years in the form of educational conferences and a summer school in elementary agriculture having prepared the way for this larger development. A course of lectures coupled with practical work is being given with an enrollment of over 100 students, and a summer school for teachers is announced for next summer to include courses in domestic science, manual training, and elementary agriculture. Dr. L. R. Jones, professor of botany, has been appointed dean of the new department and it is expected to provide additional teaching force in 1909.

Washington College and Station.—W. T. McDonald, whose resignation from the Oklahoma College and Station has been previously noted, has been appointed assistant professor of animal husbandry in the college and assistant animal husbandman in the station. George Severance, professor of agronomy, has been appointed acting head of the department of agriculture in the college, and Director Thatcher acting superintendent of farmers' institutes. Oscar M. Olson, formerly connected with farmers' institute work in Minnesota, has been appointed instructor in farmers' institutes.

West Virginia Station.—N. J. Giddings, of the Vermont Station, has been appointed bacteriologist, and Arthur L. Dacy assistant horticulturist.

Wisconsin University and Station.—The new animal husbandry building and judging pavilion is well under way, and is expected to be ready for use about February 1, 1909. The cost is estimated at about $75,000. Registration in the College of Agriculture at the beginning of the current academic year showed an increase of 63 per cent.

Arrangements have been made to conduct systematic demonstration work at the farm of the State Insane Asylum at Viroqua. It is planned to extend the work to the farms of other State institutions, with a view to providing object lessons for near-by farmers, as well as establishing distributing centers for improved seeds and other material sent out from the college and station. The

work is to be under the general supervision of C. P. Norgard, who has recently been elected assistant agronomist.

Other recent additions to the college and station staff include J. C. Marquis, editor, C. S. Hean, librarian, and the following assistants: W. A. Brannon, fertilizer and feed inspection; B. W. Hammer, agricultural bacteriology; R. R. Marshall and H. L. Walster, soils; and H. Steenbock, agricultural chemistry.

President C. R. Van Hise recently received the degree of LL. D. from Williams College.

Wyoming Station.—Alkali investigations have been taken up by the station with reference to the removal of the injurious alkali salts from the farm recently acquired, combined with a study of the underlying principles of alkali poisoning. F. S. Burrage has been appointed secretary to the board of trustees, vice Dr. Grace Raymond Hebard, who retains the secretaryship of the station council.

Experimental Work in Forestry.—It is announced that the Forest Service of this Department is to establish experimental forests in typical forest regions of the West for the investigation of forest problems. A tract already set aside at Flagstaff, Ariz., in the Coconino National Forest is to be devoted to a study of the reproduction of western yellow pine, which is not now making a satisfactory second growth.

A comprehensive study of the use and effect of wind-breaks and shelter belts is also contemplated, this to be in part in cooperation with the State experiment stations.

Commission on Country Life.—President Roosevelt has appointed two additional members of the commission, Chas. S. Barrett of Union City, Ga., president of the Farmers' Educational and Cooperative Union of America, and Wm. A. Beard of Sacramento, Cal. Dr. E. W. Allen of this Office is acting as executive secretary of the commission.

Farmers' National Congress.—The 1908 session of this body was especially noteworthy as the first to be held at an agricultural college, the meetings taking place at the University of Wisconsin, September 24–30. Over eleven hundred delegates and visitors were in attendance, the largest number ever registered. Among the speakers were Hons. W. H. Taft, W. J. Bryan, and J. J. Hill. President C. R. Van Hise, of the university, gave an address on The Conservation of the National Resources, and there were numerous demonstrations and lectures by Dean Russell, Professors Moore, Humphrey, and Alexander, and other members of the faculty. Among the resolutions adopted by the congress may be noted those endorsing the work of the agricultural colleges and urging the State legislatures to supply adequate financial support, favoring the movement for the conservation of the national resources, and approving the provisions of the Davis bill for the development of secondary agricultural education.

Conservation League of America.—The Conservation League of America has recently been organized with President Roosevelt as honorary president, and Hons. W. H. Taft and W. J. Bryan as honorary vice-presidents, and Walter L. Fisher as president. The league has chosen for its statement of principles the declaration adopted by the Conference of Governors, convened by the President May 13–15. Its purpose is announced to be "the bringing into closer relation and more intelligent cooperation the unofficial associations which have a common interest in the broader aspects of the conservation movement."

American Association for the Advancement of Science.—At the invitation of the Johns Hopkins University, the sixtieth meeting of this association will be held in Baltimore, from December 28, 1908, to January 2, 1909. In addition to the usual section programmes a symposium on public health will be held

December 31, in conjunction with the American Health League, and on January 1, under the general auspices of the association and the American Society of Naturalists there will be a celebration of the one hundredth anniversary of the birth of Charles Darwin and of the fiftieth anniversary of the publication of the first edition of the Origin of Species.

The affiliated societies of the association which have thus far indicated their intention to meet during convocation week include the American Society of Naturalists, American Mathematical Society, Association of American Geographers, Geological Society of America, Association of Economic Entomologists, American Nature-Study Society, Association of American Anatomists, American Chemical Society, American Society of Vertebrate Paleontologists, American Society of Zoologists, American Physical Society, American Psychological Society, American Physiological Society, American Philosophical Association, Southern Society for Philosophy and Psychology, American Anthropological Association, Entomological Society of America, American Folk-Lore Society, American Federation of Teachers of the Mathematical and the Natural Sciences, American Society of Biological Chemists, Sullivant Moss Society, Botanical Society of America, Society of American Bacteriologists, and Wild Flower Preservation Society of America.

First International Congress of Agricultural Associations and Vital Statistics.—The Office is in receipt of an announcement and a preliminary programme of this assembly, to be held at Brussels, Belgium, in September, 1910. The congress is to be divided into 10 sections for the consideration of topics relating to the economic and social organizations of farmers and farm laborers; societies for animal and plant production; associations for the manufacture, purchase, exportation, sale, and consumption of farm products; mutual agricultural credit and insurance societies; vital statistics and sanitation in rural districts; the promotion of the welfare of agricultural laborers; the transportation of agricultural products; measures for the improvement of country life in general; and organizations dealing with agricultural education, agricultural expositions, etc.

Those interested in the objects of this congress may obtain more complete information by communicating with P. De Vuyst, 22 avenue des Germains, Brussels, Belgium.

Agriculture at the British Association.—At the meeting of the British Association for the Advancement of Science, held in Dublin, September 2–9, the subsection of agriculture was reestablished after a lapse of several years, becoming a branch of the section of economics.

Sir Horace Plunkett served as president and in his address called attention to the marked disparity accorded to urban and rural life by those engaged in the application of science to the advancement of mankind, and advocated a more adequate recognition of agriculture by the association. He summarized the three-fold character of the construction work needed in rural life as embodying better farming, better business, and better living. The sciences were deemed most valuable to each of these three divisions, the natural sciences, especially to the first, economic science to the second and third, and educational science to all three; in other words, for rural reconstruction, research, economic investigations, and education were necessary.

Sir Oliver Lodge and J. H. Priestley presented an account of some experiments which are being made on a large scale near Worcester, England, on the effects of a high-tension electrical discharge over a growing crop. J. R. Campbell, of the Irish Department of Agriculture, explained the educational work of that department, and Dr. Carroll Dunham of Harvard University, discussed the systems of agricultural education prevailing in this country.

The second day of the association was devoted to numerous papers and discussions on plant and animal breeding. On the final day economic phases were again discussed. Several papers dealing especially with small holdings were presented, together with papers of more general scope by Dr. Graham Brooks on the moral effects of cooperation upon the workers, and Dr. Moritz Bonn, of Munich, on the status of the Irish tenant, and statistical papers by J. Wilson and W. G. Adams.

Smith's Agricultural School and Northampton School of Technology.—This institution has been opened to students, and at the close of the first week the enrollment was 114, of whom 30 were girls in the household economics course, 30 boys in the agricultural course, and 54 boys in the mechanic arts course. The agricultural course for the first year includes soils and plant life, physical geography, elementary science, practical arithmetic, bookkeeping, freehand drawing, English, algebra, American history, civil government, and mechanical work; for the second year, animal husbandry, botany, farm chemistry, farm physics, plane geometry, English, general history, and mechanical work. The course in mechanic arts during the first 2 years is the same as that of the agricultural course except that chemistry, mechanical drawing, and shop practice take the place of soils, plant life, and animal husbandry, and the household economics course differs from the agricultural course only in offering sewing or cookery in place of soils, plant life, and animal husbandry. Applicants for admission to this school who are graduates of rural schools, or who have passed the ninth grade in other schools, and are 14 years of age or older, may be admitted without examination.

Secondary School Agriculture.—The North Adams High School, North Adams, Mich., has added an agricultural course to its curriculum, in charge of R. C. Carr, a graduate of the Michigan Agricultural College. A nearby field is available for practical and experimental work.

A new agricultural high school has been established at Montague, Mass., with J. R. Parker, a 1908 graduate of the Massachusetts Agricultural College, as teacher of agriculture.

Adam Phillips, a graduate of the New York State College of Agriculture, has been elected principal of the Farragut School, Concord, Tenn., and will give considerable attention to the development of the agricultural features of instruction.

Thorntown, Ind., is a village of 2,000 inhabitants, having a high-school enrollment of 85 pupils. Nearly 60 per cent of these come from the surrounding farms and about 60 per cent are boys. All third-year pupils take agriculture as a required subject, 5 hours a week for text-book work and about 2 periods a week for laboratory work and field exercises.

Agriculture in the Elementary Schools of England.—According to a recent note in The Journal of the Board of Agriculture, instruction in rural subjects in public elementary schools of England is fostered by a system of special grants, and it appears from the report of the board of education for 1906–7 that considerable progress is being made in the teaching of gardening, fruit culture, and dairy work. Gardening is taught in every English county except two, and the number of schools which applied for grants in 1906–7 was over 900, as compared with 371 earning grants in 1903–4. The increase is almost entirely confined to counties in which a horticultural lecturer has been appointed, a part of whose duties it is to organize and supervise school gardening and to train teachers to teach it. Fruit culture is coming to be one of the important features of school gardening, and bee keeping is sometimes associated with it.

Dairying has been reintroduced into the code as a special subject for which grants may be given. It is looked upon as a subject especially valuable for girls, not only as an important branch of domestic work, but also as a means of education and as a practical means of giving instruction in the principles of hygiene.

Agricultural Education in Scotland.—A lecturer on agriculture and rural economy has been appointed in the United College of St. Salvator and St. Leonard of St. Andrews University, the oldest university in Scotland. A course of 50 lectures on the principles of agriculture will be given during the 1908–9 session. The course has been arranged to meet the requirements of candidates for the national diploma in agriculture, and will consist of illustrated lectures supplemented by demonstrations in the field, practical work in the laboratory, and in excursions to some of the best farms in the neighborhood.

A German Trade High School.—The Trade High School opened in Mannheim on May 1, 1908, is the first of such technical institutions for southern Germany. It is under the direction of the minister of justice and public instruction of the Duchy of Baden, and has for its object the provision of instruction in political economy, sociology, and agricultural science as they are related to trade and manufacturing industries.

The course consists of 4 semesters of 6 months each, the hours of instruction being mostly in the evening, as the school is intended to provide an education for those who can not devote their whole time thereto. The subjects taught are as follows: (1) Production and trade—hunting, hunting laws, and fur trade, inland and sea fisheries and trade in fishery products, forestry and lumber trade, stock raising, meat, dairy products, trade in stock, wool, hides, leather, farm and grain production, grain trade, agricultural by-products and distilling, plantations and sugar and cotton trade; (2) mining and metal industries; (3) international economy and colonial politics; (4) banks and banking; (5) science of finance; (6) life insurance; (7) protection of laborers. Special lectures will be given on State and private railway systems, the economic workings of railways and railway traffic, fundamental principles of political economy, securities, exchange and settlement of accounts, etc.

Miscellaneous.—Dr. Eric A. Nobbs, agricultural assistant to the Cape Government, has been appointed director of agriculture in Rhodesia.

The death is noted on June 3 of Dr. J. Hazard, agronomist at the Royal Agricultural Experiment Station at Möckern.

A brief description of the equipment and work of the Menominee County School of Agriculture, Menominee, Mich., is given in the *Northwestern Farmer* for October.

Farm Life (London) of August 1 contains a brief description of the location, equipment, and course of study of the Dookie Agricultural College, Dookie, Victoria, Australia.

A recent number of *Wiener Landwirtschaftliche Zeitung* gives an illustrated account of the machinery-testing station of the Agricultural High School of Vienna.

The New Brunswick legislature has established a commission consisting of the commissioner of agriculture and two others to investigate agricultural immigration and colonization conditions and possibilities of the province.

An intercollegiate stock-judging contest held at the American Royal Live Stock Show at Kansas City, Mo., was won by the Kansas College, with the Iowa College second and the Missouri University third.

EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

CONTENTS OF VOL. XX, NO. 4.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Continued.

U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

VOL. XX. DECEMBER, 1908. No. 4.

The proceedings of the recent convention of the Association of American Agricultural Colleges and Experiment Stations at Washington developed remarkable clearness of conception as to the ideals which should obtain in agricultural research and the ways and means by which these ideals may be attained. The formulation of such ideals as a basis for the administration and work of our agricultural experiment stations was most definitely made in the reports of the Commission on Agricultural Research and the standing committee on station organization and policy.

The Commission on Agricultural Research, which was appointed under resolution of the 1906 convention of the association, consisted of David Starr Jordan, Stanford University, California, chairman; Whitman Howard Jordan, of Geneva, N. Y. (elected as secretary); Henry Prentiss Armsby, State College, Pennsylvania; Gifford Pinchot, Washington, D. C.; and Carroll Davidson Wright, Clark College, Worcester, Mass.

The commission was instructed "to inquire into and report to the association the organization and policy that in the opinion of the commission should prevail in the expenditure of public moneys provided for scientific experimentation and research in the interests of agriculture, to the end that such funds shall be applied in the most economical, efficient, and worthy manner to the production of results of permanent value." It will be observed that the instructions are specific as to the scope and purpose of the inquiry, and limits it to matters pertaining to "scientific experimentation and research" having as an object "the production of results of permanent value." The commission, therefore, was not concerned with general administrative and educational questions, except in so far as they affected scientific investigation and related to the training of men to undertake such investigation. In fact, the report makes very clear the importance of differentiating as fully as practicable between scientific research and teaching, promotion, and propaganda work.

That portion of the report of the commission which relates more particularly to the research work of the experiment stations points out that:

"(1) The development of research effort has not been symmetrical and logical. Adequately trained men have not been provided in sufficient numbers to expend in the way of capable investigation the entire amounts of national and state appropriations that have been applied to agricultural research. This is one of the reasons why the more difficult agricultural problems have so largely remained untouched. . . .

"(2) Many persons nominally holding research positions have been investigators only in name, for their time and energy have been absorbed by other duties. . . .

"(3) The persistent and widespread promotion of popular education and of public good will has unquestionably had a profound, and not always immediately healthful, influence on the extent and character of . . . agricultural research. . . .

"(4) The urgent and natural call for results that would produce an immediate and favorable reaction upon the public mind has not only brought about an era of the diffusion, rather than of the acquisition, of knowledge, but has, quite generally, led to the study of problems admitting of prompt conclusions, more particularly problems of a business character directly related to financial benefit, rather than those that are fundamental. . . .

" (5) As one result of the close association of scientific inquiry and popular education a true conception of real and efficient research has not been fully maintained in the minds of all those engaged in the work of agricultural investigation. The effect of such a situation upon the progress of agricultural knowledge is obvious."

Among the recommendations which in the judgment of the commission "should guide in the promotion, organization, and prosecution of research in agriculture " and which are regarded " as essential to bringing about the conditions that all friends of agricultural progress desire to see established," are the following:

"(1) Every effort should be made to promote the training of competent investigators in agriculture both in the agricultural, and, so far as practicable, in the nonagricultural, colleges and universities, and their training should be as broad and severe as for any other field of research.

"(2) The progress of agricultural knowledge now demands that agricultural research agencies shall deal as largely as possible with fundamental problems, confining attention to such as can be adequately studied with the means available.

"(3) The work of research in agriculture should be differentiated as fully as practicable, both in the form of organization and in the relations of the individual investigator, from executive work, routine teaching, promotion, and propaganda, and should be under the imme-

diate direction of an executive trained in the methods of science who should not be hampered by other duties of an entirely unlike character.

"(4) The investigator should be free from all coercion whatever. In reaching his conclusions he should be equally free from the prescription of received opinion and the temptation to exploit his results for the purpose of obtaining future support. . . .

"(5) Any research agency charged with a single main line of investigation should be so organized that it may employ within itself all necessary processes in any branch of science. The cooperation of any or all of the departments of an experiment station on a single problem, when necessary, should be a fundamental requirement."

In the discussion that followed the presentation of the report there was a frank acknowledgment of the present difficulty of attaining such ideals, but it was also made clear that American investigators in agricultural science have made great progress in the clear comprehension of the conditions, organization, and means necessary to their attainment. A long step in advance has been made if substantial agreement can be reached as to ideals even though conditions may be such that in many cases progress toward their full realization must necessarily be slow. On this point Dr. W. H. Jordan expressed himself as follows: "It seems to me that the thing for this association to do is to establish its standards in accordance with its best judgment. These standards need not be binding upon any institution, but they may be worked on as rapidly as possible. The adoption of such standards would not mean any reflection upon any institution that is unable, because of circumstances, to entirely conform to the ideal."

The formulation of such ideals and the announcement of a purpose to work toward them as rapidly as is practicable under the circumstances prevailing in each particular case will in itself have a far-reaching influence in securing for agricultural research in this country and for those engaged in it the scientific standing and recognition they should have and in increasing the scientific efficiency as well as the practical usefulness of agricultural research by laying for it broad and enduring foundations.

The report of the standing committee of the association on station organization and policy dealt with several of the matters discussed in the commission's report, but in a somewhat more specific way. Like those of previous years, it was to a large extent based upon the consensus of opinion of station men as to the most practicable means of securing the highest efficiency in station work.

The report points out certain defects of administrative organization which still prevail to some extent, and defines the functions of administration as related to research, as follows:

"(a) To help to determine in advance whether the proposed research is profitable and altogether advisable from the standpoint of the public, whose representative for the time being the administrative officer must be.

"(b) To assist in determining what lines of experimentation are calculated to throw profitable light upon the problem.

"(c) To help determine whether the work is best carried on by one individual representing a single line of inquiry or by two or more working in conjunction, and if the latter, to secure in advance a complete understanding as to mutual duties, rights, and responsibilities. Upon all these points the judgment and the point of view of the administrative officer is not only likely to be broader but certain to be freer from personal bias than is that of the professional investigator.

"(d) The experiment once decided upon, however, and funds provided, administration is over until results are due, when it begins again and does not cease till reports are published and circulated. The less administration during the progress of the work the better for all interests, and if the need of it becomes clear, it is the best of evidence that administration was remiss at the outset. Your committee can not too strongly point out the necessity of the entire freedom as to methods of investigation on the part of the staff worker who has been employed because of his expert knowledge of the matter and methods of work in a highly specialized field."

The ideal thus presented by the committee is "administrative efficiency and sympathetic helpfulness without interference," requiring "for administrative officers men not only of good business methods and large outlook, but also with the highest obtainable training along some important line of science as related to agriculture."

The committee favors an organization "strong enough to recognize the interests of the whole station as above those of any department or separate interest and strong enough to enable the entire influence of the whole body to be exerted in any desired direction on short notice."

As regards lack of permanency and continuity of work and resulting decreased efficiency, the committee enumerates a number of causes, but is of the opinion "that the interference of teaching and extension work, and the paying of poor salaries, are among the prominent causes of unsatisfactory work and of frequent change."

The committee "reaffirms the recommendation of last year to the effect that there should be concentration on a few lines of research, and further recommends that there be close adherence to thoroughly considered, definite, and well-planned projects; that every effort be made to retain experienced and well-trained men; that an associate be appointed in each important department who shall be capable at any time of taking up the work of the chief; that the finances of the

stations be so administered as to insure the supply of all suitable facilities for work; and that the integrity of long-established experimental fields should be maintained."

In its inquiries regarding the relation of inspection work to other forms of station activity the committee finds that "the consensus of opinion leans toward an ideal station established for the purpose of research work, where little or no inspection work should impose a burden on the station; but that special conditions arise in many of the States making it of advantage to both the station and the State for the former to undertake such work."

The committee recommends that "where it seems best that the station should undertake to do inspection work (1) special funds should be provided to cover fully all expenses of such work; (2) where any considerable amount of inspection work is to be done, a separate division or department of the station be organized for carrying on the work; (3) with the exception of the administrative officers, the work be done by an independent force, paid wholly from the special funds appropriated for inspection; (4) special laboratories for carrying out the analytical work in connection with inspection work be provided."

With regard to the relation of station men to instruction, the committee finds that "the opinion is almost unanimous that research work conduces to effective teaching, so long as it does not become so engrossing as to cause the teacher to neglect his classes."

The committee therefore recommends "as an ideal policy, to be adopted as rapidly as the conditions of the various stations will permit, that those charged with research be completely freed from all responsibility for routine class-room teaching; and that as a step in this direction the teaching required of the investigator be limited to a maximum of three hours per week during one semester annually, to be given along the line of his specialty."

The recommendations of the committee will thus be seen to emphasize particularly the necessity, from the standpoint of scientific research in agriculture, for the sharp differentiation of such research work from educational propaganda and police duties and give full recognition to the fact that to secure a high order of this research work, the station organization and policy must be such that the investigator for at least the greater part of his time is free to devote undivided thought and effort to the work of investigation.

Practically, the greatest difficulty in attaining the ideals set forth in these reports grows out of the fact that in many cases our stations as organized under state laws are composite institutions. They are required to carry on control work, demonstrations, farmers' institutes, and the general diffusion of agricultural information. There will, therefore, be need of more or less reorganization of the stations, as

more exclusively research institutions. The opportunity for this is now afforded by the growing recognition of extension work as a legitimate function of the agricultural colleges. As soon as the extension departments of the colleges are efficiently organized and provided with adequate funds it should be comparatively easy to transfer to them a considerable share of the business now performed by the stations.

As far as the federal funds given to the stations are concerned, it will be the effort of this Department to confine work under the Hatch Act more strickly than ever before to experimental work of a substantial kind, and no longer to permit expenditures from that fund for farmers' institute work, extension teaching, or the preparation of compilations. The Adams fund will, of course, be restricted to "original research."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

On the determination of phosphoric acid, U. Milone (*Atti. 6. Cong. Internaz. Chim. Appl., 1 (1906), pp. 63, 64*).—A comparison of the methods of Bongartz, Leconte and Pincus (modified Neubauer), and Sonnenschein is reported, the results indicating that the method of Bongartz [a] is quick and reliable. This method is based on that of Thomson,[b] in which phosphoric acid is determined by titration first with normal sulphuric acid using methyl orange as an indicator, and then after boiling and cooling with the same acid using phenolphthalein as an indicator.

Standardization of uranium solution for determining phosphoric acid, F. Repiton (*Monit. Sci., 4. ser., 21 (1907), II, No. 792, pp. 815, 816; abs. in Chem. Zentbl., 1908, I, No. 3, p. 295; Jour. Chem. Soc. [London], 94 (1908), No. 547, II, p. 428*).—In applying the uranium method to the determination of phosphoric acid in calcium phosphate it is advisable to standardize the uranium solution with a solution of calcium phosphate containing an accurately known amount of phosphoric anhydrid. For the accurate determination of the phosphoric anhydrid the author recommends the iron method in which phosphoric acid is precipitated by a solution of ferric nitrate of known strength and the excess of iron precipitated by boiling with ammonium acetate. The combined weight of the two precipitates less the amount or iron oxid used equals the weight of phosphoric anhydrid.

The determination of potash by the platinum chlorid method, H. J. F. de Vries (*Chem. Weekbl., 4 (1907), pp. 231–242; 333–343; 455–462; 5 (1908), pp. 176–184; 261–269; abs. in Chem. Zentbl., 1908, I, No. 17, p. 1647; Jour. Chem. Soc. [London], 94 (1908), No. 508, II, p. 534*).—In this article the author reviews the various investigations which bear upon the causes of error in this method of determining potash and gives his own views as to the best means of avoiding them.

He concludes that the best results with both pure potassium chlorid and mixtures of potassium chlorid with either sodium chlorid or magnesium chlorid, or both, are obtained with the use of 96 per cent alcohol. With both 80 per cent and 96 per cent alcohol much better results were obtained by employing the empirical factor 0.3056 than by using the theoretical factor 0.3071 based upon the latest international atomic weights. The wide variation in results, sometimes amounting to as much as 4 per cent, can not, however, be explained by the kind of alcohol used or the method of calculation, but is due primarily to the presence of sulphuric acid. In the presence of sulphuric acid 96 per cent alcohol gives uniformly too high results and 80 per cent alcohol to low.

On the volumetric determination of potassium as the cobalti-nitrite, W. A. Drushel (*Chem. News, 97 (1908), No. 2520, pp. 124–126; abs. in Science, n. ser., 28 (1908), No. 711, p. 219*).—See a previous note (E. S. R., 19, p. 808).

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[a] Arch. Pharm., 3. ser., 22 (1884), p. 846.

[b] Chem. News, 47 (1883), p. 186.

A volumetric method for the simultaneous determination of carbon dioxid and other acids in the air, H. Henriet and M. Bouyssy (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 21, pp. 1100, 1101; abs. in Rev. Sci. [Paris], 5. ser., 9 (1908), No. 23, p. 731; Chem. Zentbl., 1908, II, No. 2, p. 196*).—By thoroughly washing the current of air in a soda solution of known strength the carbon dioxid and other acids are absorbed and may be determined by titration with acetic acid, using phenolphthalein as indicator, then adding barium chlorid and titrating a second time, as is done in the determination of free soda in the commercial product.

The detection of small quantities of carbon monoxid in the air, J. Ogier and E. Kohn-Abrest (*Ann. Chim. Analyt., 13 (1908), Nos. 5, pp. 169–173, fig. 1; 6, pp. 218–224, figs. 2*).—The apparatus and procedure for methods based upon the absorption of carbon monoxid in blood and the spectroscopic examination of the blood after the fixation of the oxid are described in some detail in this article. The author believes that such methods are of great value and that the reactions observed are such as are produced by carbon monoxid alone and not by any hydrocarbon gas.

A new method of enumerating bacteria in air, C. E. A. Winslow (*Science, n. ser., 28 (1908), No. 705, pp. 28–31, figs. 2*).—The method described is a modification of that used by Hesse, in which the bacteria are collected by slowly aspirating air through a long roll-tube, the walls of which are covered with melted gelatin. The modification consists mainly in an increase in the size of the culture vessel relative to the sample of air. This is accomplished by drawing the air in succession through two 1½ liter bottles, on the bottom of each of which is a layer of nutrient gelatin.

Tests are reported which indicate that the method "seems to offer a more accurate procedure for bacterial examination of air than any yet available," although it is not so convenient as the sand filter method commonly used.

Determination of nitric acid in water, L. Grünhut (*Ztschr. Analyt. Chem., 47 (1908), No. 5, pp. 324–327*).—This is a review of a number of recent contributions to the subject, namely, those of R. Woy (E. S. R., 14, p. 328), A. Müller (E. S. R., 15, p. 336), P. Drawe (E. S. R., 18, p. 7), H. Noll, H. Grosse-Bohle (E. S. R., 15, p. 851), and A. F. Dokuchayev (E. S. R., 15, p. 1052).

Observations on hardness in water and its removal, E. E. Basch (*Ztschr. Öffentl. Chem., 14 (1908), No. 7, pp. 124–133*).—This is a discussion of the value for technical purposes of various methods of determining and removing hardness in water, especially the method proposed by Hundeshagen (E. S. R., 19, p. 809).

Lead in drinking water, its harmfulness and methods of determination, H. W. Woudstra (*Chem. Weekbl., 5 (1908), Nos. 12, pp. 185–204; 13, pp. 207–216*).—The literature of investigations on the poisonous properties of lead in water is reviewed and gravimetric and volumetric methods of determination are described.

Süchting's improved method of determining the acidity of soils, A. J. van Schermbeek (*Jour. Prakt. Chem., n. ser., 77 (1908), No. 10–11, pp. 489–497; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 11, p. 581; Jour. Chem. Soc. [London], 94 (1908), No. 550, II, pp. 743, 744*).—The author criticises Süchting's modification of Tacke's method (E. S. R., 19, p. 1009), asserting that the modified method does not determine the amount of acid in the soil but that which accumulates in a mixture of finely divided soil and calcium carbonate stirred up with a considerable amount of water and allowed to stand for several hours. If the mixture is not sterilized considerable acid may be formed by the decomposition of the organic matter.

Süchting's improved method of determining acidity in soils, B. Tacke and H. Süchting (*Jour. Prakt. Chem., n. ser., 78 (1908), No. 15–16, pp. 139–142*).—This is a defense of the method against the above criticisms of A. J. Van Schermbeck.

Estimation of sugar by the Allihn or Meissl method, H. Schaumann (*Ztschr. Analyt. Chem., 47 (1908), No. 4, pp. 235–237, fig. 1*).—Apparatus is described which, according to the author, greatly facilitates the determination of sugar by the Allihn or Meissl method. The improvement consists in drawing into the filter tube, by means of suction, the solution containing the cuprous oxid instead of pouring it in.

The volumetric determination of reducing sugars, A. R. Ling et al. (*Analyst, 33 (1908), No. 386, pp. 160–173*).—A critical examination of methods. The paper is followed by a discussion. For earlier work see a previous note (E. S. R., 17, p. 335).

Critical studies of quantitative estimation of glycogen by means of inversion with acids, W. Grebe (*Arch. Physiol. [Pflüger], 121 (1908), No. 11–12, pp. 604–635*).—A critical study of methods.

Methods for preparing lecithin and other phosphatids from seed, E. Schulze (*Ztschr. Physiol. Chem., 55 (1908), No. 3–4, pp. 338–351*).—In this discussion of methods data are reported regarding the phosphatids of wheat embryo and a number of other seeds.

Observations on the stability of lecithin, J. H. Long (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 881–895*).—That emulsions of egg and brain lecithin are comparatively stable with respect to temperature is the conclusion drawn from the author's investigations. The characteristics of such lecithin emulsions were studied.

On the oxidation of olive oil, A. H. Gill (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 874–876*).—In connection with a study of so-called wool oil employed in the manufacture of "tops," i. e., wool roving or wool which has been partially spun, the oxidation of olive oil under different conditions was studied. In harmony with earlier work, the author concludes that "except when spread out in a finely divided condition as upon cotton, olive oil changes but little on exposure to the air or heat."

Note on honey analysis, F. Schaffer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 10, pp. 604–606*).—Analyses of honey made from Coniferæ are reported and discussed with reference to honey standards.

Honey, A. Reinsch (*Ber. Chem. Untersuch. Amt. Altona, 1907, pp. 25–29; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, p. 493*).—Four samples of pure honey showed an ash content of 0.06 to 0.17 per cent, the sample with the lowest ash content being a mixture of clover and linden honey. In the author's opinion, the minimum value for the ash content required under the German pure-food law should be changed from 0.1 per cent to 0.05 per cent.

Has the estimation of the ash content and the Ley reaction value in honey analysis? Utz (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 10, pp. 607–609*).—A controversial article.

Judging marmalades, F. Härtel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, pp. 462–472*).—Recipes for a number of sorts of marmalade are given and the questions of definitions, the use of starch sirup, artificial coloring matters, etc., with reference to marmalade making, and the determining of its character with respect to the requirements of pure-food laws are discussed.

Sampling and judging ground white pepper, E. Spaeth (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, pp. 472–484*).—According to the results of the author's investigations, 4 per cent mineral matter and 7.5 per cent crude

fiber are satisfactory standard values for judging of the quality of ground pepper. The idea that the perisperm of the unripe black pepper has a higher content of crude fiber than the ripe white peppercorn is, according to the author, erroneous. The best method for the detection of the addition of hulls, in his judgment, is the determination of the crude fiber content.

A new pepper adulterant, N. Petkoff (*Ztschr. Offentl. Chem., 14 (1908), No. 7, p. 133*).—The author found that powdered graphite was used for coloring black pepper. It was apparently mixed with some sort of gum solution. The ash content of such peppers was high, ranging from 12 to 12.6 per cent. The alkalinity, on the other hand, was about normal, ranging from 50 to 51 per cent.

Lead in cream of tartar, tartaric acid, and citric acid, R. R. Tatlock and R. T. Thomson (*Analyst, 33 (1908), No. 386, pp. 173–178*).—The authors state that in their experience the average amount of lead found in cream of tartar has been 0.005 per cent, in tartaric acid 0.0005 to 0.012 per cent, and practically the same amount in citric acid. The paper, which is followed by a discussion, also takes up the question of analytical methods.

The copper content of cocoa shells, E. Tisza (*Schweiz. Wchnschr. Chem. u. Pharm., 45 (1907), p. 526; abs. in Hyg. Zentbl., 4 (1908), No. 1, p. 16*).—Copper was determined by the electrolytic method, the highest amount found being 0.01 per cent. In half the samples no copper was found and the author believes that when it occurs in minute quantities it is naturally present.

The detection of cocoa shell in cocoa goods, G. Devin and H. Strunk (*Apoth. Ztg., 23 (1908), No. 33, p. 302*).—The authors discuss their analyses with reference to the detection of cocoa shell and conclude that removing the hexoses before determining the pentosans is to be recommended. The addition of 10 per cent cocoa shell can be detected by determining the amount of silicic acid in the ash.

The chemical standardization of foods and drinks, with special reference to cider and perry, H. E. Durham (*Jour. Roy. Inst. Pub. Health, 16 (1908), No. 5, pp. 287–295*).—French and German laws are discussed with special reference to cider and perry in Great Britain, and analytical work is reported which has to do with the amount of alcohol, ash, and other constituents, and the relation of these constituents to standards.

The legislation of different countries regarding the sulphuring of wine, H. Mastbaum (*Chem. Ztg., 33 (1908), No. 34, pp. 427, 428*).—A summary of legal data.

The detection of formic acid in foods, A. G. Woodman and A. L. Burwell (*Technol. Quart., 21 (1908), No. 1, pp. 1–3*).—In the method outlined the formic acid is converted into calcium formate, which is subjected to dry distillation and treated with standard fuchsin-aldehyde, the resulting color being compared with a standard color. From their own experience, which is briefly summarized, the authors consider that the method is very delicate.

The quantitative estimation of rice hulls in feeding stuffs, F. Schröder (*Arb. K. Gsndhtsamt., 28 (1908), p. 213; abs. in Chem. Ztg., 32 (1908), No. 30, Repert., p. 200*).—The presence of rice hulls, according to the author, may be detected with a microscope. The method for estimating the quantity present depends upon the proportion of silicic acid and the ratio of this material in the feeding stuffs to the amount normally present in rice hulls.

Regarding the methods of investigations of butter and other fats, Grimmer (*Milch Ztg., 37 (1908), Nos. 11, pp. 121–132; 12, pp. 133–144; 13, pp. 487, 488*).—By the use of the method of Wijsman and Reijst in examination of and chemical constants of butter commonly considered are summarized.

Detection of cocoanut oil in butter by means of the "silver value," C. Barthel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 8, pp. 487, 488*).—By the use of the method of Wijsman and Reijst in examination of pure butters and mixtures of butter and cocoanut oil the author at first obtained results which gave indication that the method could be used for detecting the presence of cocoanut oil in butter, but in later experiments with pure butters the method appeared to be unreliable. Butter produced by cows fed on sour beet roots yielded a second "silver value" that was appreciably higher than the first.

Notes regarding cacao butter, F. Strube and D. Sohne (*Ztschr. Öffentl. Chem., 14 (1908), No. 4, pp. 67–70*).—The author reports certain chemical and physical data obtained in the examination of cacao butter from different sources. He found that different methods of separation of the cacao butter had no appreciable effect upon the constants of the substance. For the detection of foreign fats employed in the adulteration of cacao butter the author recommends the method of Cohn.

Digestion and distillation apparatus for nitrogen determination, G. Jakob (*German Patent No. 204262; Ztschr. Chem. Apparatenk., 3 (1908), No. 5, pp. 122, 123, fig. 1*).—A convenient and compact device for digestion and distillation in the same set of flasks is described.

The determination of nitrogen according to Dumas, H. Leeman (*Chem. Ztg., 32 (1908), No. 41, p. 496, fig. 1; abs. in Analyst, 33 (1908), No. 388, pp. 296, 297*).—A device for controlling the flow of carbon dioxid through the combustion tube is described.

Flask for fat determination, W. L. Dubois (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 797, 798, figs. 2*).—A flask for use in fat extraction is described, which, according to the author, may be readily cleaned.

Report on the most important progress in agricultural chemistry during the last year, A. Stutzer (*Chem. Ztg., 32 (1908), No. 38, pp. 466–468*).—The most important scientific contributions to the assimilation of plant food through the roots of plants, fertilizers, and animal nutrition are briefly referred to.

Annual report for 1907 of the consulting chemist, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 210–220*).—Analyses of a number of feeding stuffs and of fertilizers and miscellaneous materials are reported.

METEOROLOGY—WATER.

Wireless telegraphy and meteorological information (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 17, p. 527*).—This is a brief statement regarding the extent to which wireless telegraphy has been used in Great Britain and the United States for the dissemination of meteorological information.

The application of wireless telegraphy to the improvement of storm warnings, G. Bigourdan (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 17, pp. 885–887; abs. in Rev. Sci. [Paris], 5. ser., 9 (1908), No. 19, p. 603*).—The advantage of a knowledge of the meteorological conditions at sea which can be attained by means of wireless telegraphy is pointed out.

The development of meteorological observations in Africa (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 19, p. 594*).—This is a brief account of progress made in establishing systematic meteorological observations in different parts of Africa.

Weather observations in connection with cultural and fertilizer experiments, Grohmann (*Fühling's Landw. Ztg., 57 (1908), No. 8, pp. 290–298*).—The value and importance of such observations are pointed out.

Temperature conditions of the earth. M. Hottinger (*Gesundhts. Ingen., 31 (1908), No. 24, pp. 375–379, figs. 4*).—This article discusses the relation of altitude, latitude, depth in the soil, and other conditions on temperature, particularly in its bearing on habitableness.

Monthly Weather Review (*Mo. Weather Rev., 36 (1908), Nos. 5, pp. 125–160, figs. 9, charts 7; 6, pp. 161–196, figs. 4, charts 6*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of May and June, 1908, recent papers bearing on meteorology and seismology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 5.—Weather Influences Preceding the Evacuation of Boston, Mass. (illus.), by W. N. Lacy; The Work of Prof. Carl Störmer on Birkeland's Theory of the Aurora Borealis, by J. A. Anderson; The Warm Stratum in the Atmosphere, by A. L. Rotch; Tornadoes in Louisiana, April 24, 1908 (illus.), by I. M. Cline; Tornadoes in Mississippi, April 24, 1908, by W. S. Belden; Tornadoes in Alabama, April 24 and 30, 1908 (illus.), by F. P. Chaffee; Tornado at Dora and Bergens, Ala., April 24, 1908 (illus.), by W. F. Lehman; Observations of a Tornado near Fort Worth, Tex., by D. S. Landis; Tornadoes in Minnesota on May 24, 1908; Severe Local Storm in Florida; A Hurricane in the West Indies in March, 1908, by J. T. Quin; Tornado at Pekin, Ill., March 27, 1908, by D. A. Seeley; Windstorm at Peoria, Ill., May 5, 1908, by D. A. Seeley; Ice Conditions on the Great Lakes, Winter of 1907–8, by N. B. Conger; Early Meteorology at Harvard College, by B. M. Varney; The Meteor of October 5, 1907, Over New Jersey and Pennsylvania, by H. A. Peck; Some Meteorological Uses of the Polariscope, by L. Bell (E. S. R., 20, p. 13); Ice Movements and Currents in Bering Strait; An Elementary Method of Deriving the Deflecting Force Due to the Earth's Rotation (illus.), by T. Okada; and biographical note on William M. Husson.

No. 6.—A Graduate School of Meteorology; Progressive Climatic Variations on the Isthmus of Panama (illus.), by H. L. Abbot; Severe Windstorms in Ohio, June 19, 1908 (illus.), by J. W. Smith; Severe Windstorm in South Dakota, by S. W. Glenn; Tides of the Solid Earth, Observed by Doctor Hecker (illus.), by R. L. Faris; Some Climatic Influences in American History, by W. N. Lacy; Damage by Frost at Middlebranch, Ohio (illus.); The Climate of Spokane, Wash., by C. Stewart; The Climate of the Canadian Yukon; The Study of English [for Meteorologists]; The Smithsonian Meteorological Tables; National Conservation Commission; Where and How Can Our Observers Pursue the Study of Modern Science? Weather Bureau Men as University Students, by J. K. Hooper; and An Annotated Bibliography of Evaporation, by Mrs. G. J. Livingston.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and R. C. Lindblad (*Massachusetts Sta. Met. Buls. 235, 236, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1908. The data are briefly discussed in general notes on the weather of each month.

Meteorology, F. W. Christensen and H. D. Edmiston (*Pennsylvania Sta. Rpt. 1907, pp. 28–39, 175–198*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 19, p. 814). Monthly summaries of observations are given in the body of the report and the detailed record in an appendix. The summary for 1906 is as follows:

Summary of meteorological observations, 1906.

	1906.	Growing season (Apr.–Sept.).
Barometer (inches): Mean	30.049	
Temperature (° F.):		
Mean	49.5	63.8.
Highest	99 (June 9 and 30)	90 (June 9 and 30).
Lowest	−8 (Feb. 6)	23 (Apr. 1).
Greatest daily range	38 (Oct. 13)	37 (Apr. 26).
Least daily range	3 (Oct. 23)	
Mean daily relative humidity (per cent)	83.6	79.1.
Rainfall (inches)	34.15	18.99.
Number of days on which 0.01 in. or more of rain fell	141	64.
Mean percentage of cloudiness	5.4	5.2.
Number of days on which cloudiness averaged 80 per cent or more.	125	48.
Last frost in spring		May 29.
First frost in fall		Nov. 2.

Meteorological statistics, R. F. Stupart (*Irrigation in the Provinces of Alberta and Saskatchewan, 1906 and 1907. Ottawa: Dept. Int., 1908, pp. 5, 6, 28–38*).—Observations on rainfall and temperature at Calgary, Chaplin, Swift Current, Medicine Hat, and Macleod are given for 1906 and previous years, in some cases as far back as 1883.

How much rain does the earth receive annually? (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 22, pp. 688, 689*).—This article briefly summarizes the various estimates which have been made on this point. The average total annual rainfall of the earth is placed at 465,000 cu. km., of which 112,000 cu. km. falls on land and 353,000 cu. km. on sea.

The damage done by cyclones (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 19, p. 594*).—Statistics of persons killed and buildings destroyed by the principal cyclones from 1722 to 1900 are reported.

On hail protection appliances, J. Violle (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 11, pp. 346, 347*).—Experiments with explosives discharged from captive balloons are reported, but it is thought that the experiments were too few in number to give conclusive results. It is believed that more extensive and systematic experiments should be made.

The underground waters of Cape Colony, C. F. Juritz (*Agr. Jour. Cape Good Hope, 32 (1908), Nos. 5, pp. 634–647; 6, pp. 749–771; 33 (1908), No. 1, pp. 85–98*).—A large number of analyses are reported and the character of the waters is discussed.

Chemical analyses of water from dew ponds, S. Skinner (*Nature [London], 78 (1908), No. 2011, p. 30*).—Determinations of calcium carbonate and chlorin in samples of water from dew ponds in limestone regions as compared with similar determinations in water from a spring near one of the ponds are reported to show that the water of the ponds is low in calcium carbonate, thus indicating that the ponds "are simply water butts in which rain water is stored." The influence of the proximity of the sea is shown by a considerable increase in the proportion of chlorin in the water.

The drinking water supply of cities from a chemical standpoint, W. Hempel (*Umschau, 12 (1908), No. 27, pp. 523–527*).—The great importance of a suitable supply of drinking water for cities is pointed out. The author believes that the best results can be obtained by supplying soft water for laundry purposes, steam engines, etc., and hard water derived from deep underground sources for drinking purposes. He condemns the use of surface waters for drinking purposes.

SOILS—FERTILIZERS.

Soil surveys in the United States (*Jour. Bd. Agr. [London], 15 (1908), No. 1, pp. 48, 49*).—The progress, character, and uses of the soil surveys of the Bureau of Soils of this Department are briefly described, and the need in Great Britain of more systematic work of this kind than has heretofore been undertaken is pointed out.

Cartography of southwestern Louisiana with special reference to the Jennings sheet, G. D. Harris (*Geol. Survey La. Bul. 6, pp. 3–24, maps 2*).—This is one of the series of reports of the Geological Survey of Louisiana which has been carried on for several years under the direction of the State experiment stations. A map showing 5-foot contours of a portion of Calcasieu and Acadia Parishes, which it is believed will be of much service in rice culture and canal and levee construction, is given.

Results of analyses of soils, F. F. Villaseñor (*Mem. y Rev. Soc. Cien. "Antonio Alzate," 26 (1907), Nos. 4, pp. 109–114; 5, pp. 159–170*).—Notes on the general character and physical and chemical analyses of a number of samples of cultivated soils from different parts of Mexico are reported in this article.

Soil analysis (*Rhodesian Agr. Jour., 4 (1907), No. 6, pp. 596–601*).—Chemical and mechanical analyses of 6 samples of soils from the Gwelo district of Rhodesia are reported.

Manuring of Rhodesian soils (*Rhodesian Agr. Jour., 4 (1907), No. 6, pp. 541–552*).—Analyses of a number of samples of Rhodesian soils are reported, with suggestions as to their fertilizer requirements. The analyses show that as a rule the soils are somewhat deficient in lime and phosphoric acid.

Contribution to the study of the Amur region, S. V. Sichusev (*Pochvovyedyenie [Pédologie], 1906, pp. 81–89; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 5, p. 548*).

Tea soils of the Black Sea coast of the Caucasus and of some districts of China and Japan, Zemyatchenskiĭ and Adamov (*Selsk. Khoz. Sborn. Udyel. Vyed., 1 (1905), pp. 147–224; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 5, pp. 534, 535*).

Contribution to the study of soils, P. de Sornay (*Sta. Agron. Mauritius Bul. 17, 1908, pp. 79*).—The sampling and physical and chemical analysis of soils are discussed with special reference to the applicability and importance of such methods of examination in the case of Mauritius soils. The methods of analysis adopted and used in some preliminary study of the soils of Mauritius are described. The character of these soils as compared with soils of similar islands on which sugar cane is grown is also discussed. It is shown that while the soils of Mauritius are as a rule quite rich in fertilizing materials, they produce less sugar than, for example, those of Hawaii. This is attributed to the fact that the soils have not been thoroughly studied and the use of fertilizers systematically undertaken.

The productiveness of the soil: Geological and climatological factors, A. Grégoire (*Ann. Gembloux, 18 (1908), No. 4, pp. 225–241, figs. 2*).—This is the fourth of a series of articles discussing in a broad way the factors of soil fertility (E. S. R., 20, p. 216). The general conclusion reached in the present discussion is that the study of climatic and geologic factors is of great importance in agrology. They give valuable indications of the phenomena occurring in the soil and furnish a guide for the preparation of agronomic charts, i. e., for the comparative study of soils.

Oroclimatic basis of classification of soils, G. N. Vysotski (*Pochvovyedyenie [Pédologie], 1906, pp. 1–18; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), 5, pp. 536–538*).

Investigations on processes of weathering, K. D. Glinka (*Trav. Soc. Imp. Nat. St. Petersb., Sect. Géol. et Min., 34 (1906), No. 5, pp. 1–178; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 5, pp. 546, 547*).—This treatise contains a detailed review of the literature of the subject and original investigations, most of which have already been published by the author (E. S. R., 19, p. 315).

In the last part of this treatise he discusses the subject of types of weathering, holding that in the future it will be possible to establish the types of weathering according to the chemical processes taking place in a given case. He indicates as the chief agents of weathering, carbonated water, weak salt solutions, humic acids and akali humates, and alkali carbonates, the participation of these or other agents depending mainly on the climatic conditions of the locality. The chief climatic factor is moisture, hence he suggests a possible soil classification based upon the degree of moisture as follows: (1) Soils with optimum humidity—laterites, red earths; (2) soils with medium humidity—podzols, forest soils; (3) soils with moderate humidity—chernozems, regurs; (4) soils with insufficient humidity—brown, gray, lamellar-columnar soils of semideserts; (5) soils with excessive humidity—marshy, semimarshy; (6) soils with temporarily excessive humidity—alkali lands.

On the nature of clay soils according to old and recent investigations, A. Atterberg (*K. Landtbr. Akad. Handl. och Tidskr., 46 (1907), No. 6, pp. 385–424; abs. in Zentbl. Agr. Chem., 37 (1908), No. 9, pp. 579, 580*).—This is a critical study of different systems of classification of clays, and of our present knowledge of their nature and characteristics, with an account of the author's views based on original investigations. The subject is discussed under the following headings: The external characteristics of clay soils; their classification; is kaolin a characteristic component of clays; the absorption phenomena; zeolitic substances as components of clay; the properties of the colloidal substances; on the nature of the colloids; are clay substances actual colloids; the composition of the decomposition silicates soluble in hydrochloric acid in northern clays; the Russian black soils and North American soils; and composition of the difficultly soluble decomposition silicates; and the inert components of clay soils.

The author is of the opinion that kaolin is not a characteristic component of clays. What has previously been taken for kaolin in northern clays is apparently composed of fine mica particles. The most characteristic ingredients of clays appear to be particles of the fineness of the colloids, while the zeolitic colloids are the most important component of clays, agriculturally speaking, as they are of other types of soils. The zeolites and other components soluble in hydrochloric acid ("decomposition silicates") differ greatly in composition according to the course of the decomposition processes under different climatic conditions, the end products being either mixtures of kaolin, aluminum hydroxid, and iron oxid, or zeolite-like double silicates of aluminum and iron oxids, with a high content of monoxids, besides gravel and sand. In the northern clays kaolin and aluminum hydroxid appear to play only a minor part or no part, but where kaolin and bauxite occur in quantities in the older formations they may also be expected in the sedimentary clays.

On the eolian origin of the soil salts, J. J. Pivovarov (*Pochrovycdyenie [Pédologie], 1906, pp. 67–80; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 5, pp. 547, 548*).—The article gives a survey of the literature of the subject in connection with the hypothesis of Vysotski concerning the formation of alkali lands.

Denudation of the steppe, A. IVCHENKO (*Zhegh. Ghcol. Min. Rossii, 1905, pp. 216–240; 1906, pp. 135–197; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 5, p. 550*).—Contains among other things a very detailed classification of alkali lands.

Humus, R. MCMURTRIE (*Amer. Fert., 28 (1908), No. 4, pp. 5–11*).—This is a summary of information regarding the composition and functions of humus in the soil.

On changes of availability of nitrogen in soils, II, O. LOEW and K. ASO (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 567–574; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 549, II, p. 621*).—In an earlier article on this subject (E. S. R., 19, p. 119) attention was called to "the existence of bacteriolytic enzyms which probably play a rôle in the soils when the nitrogen of bacteria is rendered available for the roots."

This article reports culture experiments with *Bacillus pyocyaneus*, *B. mycoides*, *B. megatherium*, *B. subtilis*, *B. fluorescens liquefaciens*, and *Proteus vulgaris* to determine whether these common soil bacteria produce bacteriolytic enzyms. The results showed that the organisms under suitable conditions produce bacteriolytic enzyms which gradually render new bacterial growth difficult. "Since this may happen also in the soil, some explanation can be furnished for the fact that bacterial life does not increase infinitely in organically manured soils." Other investigations bearing on this subject are briefly reviewed.

The enrichment of soil in nitrogen by bacteria and its significance for plant nutrition, J. STOKLASA (*Deut. Landw. Presse, 35 (1908), Nos. 25, pp. 274, 275; 26, pp. 286, 287; 27, pp. 297, 298*).—This is a review of an article by Koch and others (E. S. R., 20, p. 17), with a brief account of the author's recent experiments with different organisms on oats, beets, and potatoes, the results of which confirm his former conclusions. In soils inoculated with *Azotobacter chroococcum* adequately supplied with mannite or grape sugar and lime the number of organisms was increased and both the yield and quality of the crops were improved.

The biology of root tubercle bacteria of leguminous plants in the light of recent investigation, F. FUHRMANN (*Mitt. Naturw. Ver. Steiermark, 1907, pp. 34–36; abs. Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 18–20, p. 618*).—The article briefly reviews the more important contributions to this subject. It is stated that the fixation of atmospheric nitrogen by the root-tubercle organisms begins when the bacteroids have reached a stage when they are colored brown-red by addition of tincture of iodin. This occurs only when the organisms are feeding almost exclusively upon carbohydrates and the available nitrogen compounds have been almost completely exhausted. The question of whether the process of assimilation is the result of symbiosis or parasitism is also discussed.

Experiments on the accumulation of green manure nitrogen in light sandy soils, C. VON SEELHORST (*Mitt. Deut. Landw. Gesell., 23 (1908), No. 10, pp. 83–89*).—The results here reported confirm those of earlier experiments (E. S. R., 18, p. 538) in showing as a rule a decided decline in soil nitrogen from green manured soil as a result of growth of crops and loss in drainage.

On observation of the continuous growth of peas on the same soil, S. SUZUKI (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 575–577*).—The results of four years' continuous culture of peas grown in pots on humus loam soil unfertilized and fertilized in various ways are reported. These show that no trace of soil "weariness" or "sickness" appeared when the soil was liberally fertilized. The author therefore is inclined to accept the view that soil sickness may in some cases be due simply to deficiency of available plant food.

Maximum productiveness of soils in pots, K. K. Gedroiz (*Trudui Selsk. Khoz. Khim. Lab. St. Peterb., 4 (1905), pp. 103–112; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8 (1907), No. 5, p. 583*).—Experiments made in vegetation pots with oats and mustard on 13 soils of different character showed that the maximum productiveness of the soils, i. e., the yield when fully provided with nutritive substances, was not alike under like conditions and varied for oats and mustard.

Need of fertilizing by Russian soils of various localities according to the vegetation method, K. K. Gedroiz (*Trudui Selsk. Khoz. Khim. Lab. St. Peterb., 4 (1905), pp. 1–64; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8 (1907), No. 5, pp. 582, 583*).—Results are given of investigation, by the vegetation method, of the need of 22 soils for fertilizers, with chemical analyses of the soils. From indirect indications obtained in these investigations and from theoretical considerations the author concludes that this method is altogether inapplicable to the determination of the need of soils for nitrogenous fertilizers and that its suitability in the case of other fertlizers is more than doubtful.

Available phosphoric acid in chernozem soils, A. S. Kudashev (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8 (1907), No. 5, pp. 481–510, fig. 1; abs. in Zentbl. Agr. Chem., 37 (1908), No. 8, pp. 505–507*).—The object of this investigation was to find out whether extraction with oxalic acid is suitable for the determination of the phosphoric acid available to plants. The investigations included (1) vegetation experiments with oats, using all fertilizers except phosphoric acid, and (2) treating the soils with 0.5 per cent solution of oxalic acid and estimating the phosphoric acid in the extract.

Experiments were made with 49 soils from the various governments of the chernozem region of European Russia. The extraction was made by treating 200 gm. of soil during 3 hours with 800 cc. of 0.5 per cent solution of oxalic acid, shaking repeatedly, and then allowing to settle for 1 hour after the addition of 4 gm. of potassium chlorid.

Although the experiments, as the author states, were not carried out under favorable conditions, they seem to strongly indicate (1) that in soils of the same type the yields of oats, when phosphoric acid is in the minimum, increase nearly proportionately to the quantity of phosphoric acid extracted by 0.5 per cent solution of oxalic acid, and consequently this phosphoric acid is approximately proportional to the phosphoric acid assimilated by oats, and (2) that in soils of different types, e. g., in the eastern soils (richer in clay and humus) and the western soils (more sandy) of the chernozem region the phosphoric acid extracted by a 0.5 per cent solution of oxalic acid multiplied by the loss on ignition (which is approximately proportional to the amount of clay, humus, and carbon dioxid in a soil) is approximately equal or proportional to the phosphoric acid assimilated from the soil.

Washing of soils and methods of prevention, J. G. Mosier (*Illinois Sta. Circ. 119, pp. 16, fig. 1*).—This circular briefly discusses the relation of rainfall and run-off to surface washing, and explains that the washing produced by the run-off is of two kinds, sheet washing or general surface washing and gullying. Four methods of preventing sheet washing are explained, namely, the growing of cover crops, increasing the organic matter in the soil, tillage, and terracing and hillside ditching. Various methods of preventing and checking gullying are also described.

The Bremen moor culture station, B. Tacke (*Illus. Landw. Ztg., 28 (1908), No. 14, pp. 112–115, figs. 7*).—This article describes the methods employed and reviews the progress made by the Bremen moor station in reclaiming moor lands.

Examinations of barnyard manure and liquid manure on Danish farms, R. K. KRISTENSEN and F. HANSEN (*Tidsskr. Landbr. Planteavl, 14 (1907), pp. 515–570, figs. 3*).—Experiments were conducted on 6 different farms for the purpose of studying the accuracy of methods of sampling manure heaps. Three or four samples were taken at each place and analyzed for nitrogen, dry matter, and ash. The samples were taken by cutting at least 6 square holes in the manure pile by means of a hay knife, and uniting the columns of manure thus obtained, making a sample of about 50 lbs. weight, which was then worked over thoroughly and about 3 lbs. taken for analysis. Prior to drying the samples in the laboratory, tartaric-acid solution was added to prevent loss of volatile nitrogen compounds. When the manure was sampled as hauled out, a forkful of each load was placed in a tightly covered box, and from the lot of about 600 lbs. of manure a 3-lb. sample was secured for analysis. This method of sampling gave very satisfactory results, especially where the manure was of a rather uniform composition, agreeing within 0.05 per cent for nitrogen and within 1 to 2 per cent for dry matter. Greater variations occurred in the ash, owing to frequent admixtures of foreign inorganic materials like dirt from roots, yard sweepings, etc.

The influence of the feed on the nitrogen content of the liquid manure was studied in a series of experiments. Samples of cow urine from 45 different Danish farms were examined and their composition studied with reference to the influence of the system of feeding practiced. The influence of heavy or light feeding of oil cakes, concentrates, straw, or roots could not be traced to any marked degree in the nitrogen content of the urine. On the other hand the urine obtained on heavy feeding of hay contained on the average 0.498 per cent of nitrogen against 0.429 per cent in that from light hay feeding (averages for 23 and 22 farms, respectively). The differences in the case of the other feeds mentioned were within a few hundredths of 1 per cent when a heavy or a light system of feeding of a particular feed was practiced.

The manner of covering liquid-manure tanks was found of great importance with regard to the losses of nitrogen, cow urine kept in carefully covered tanks containing on the average 0.615 per cent of nitrogen while that from poorly covered tanks contained only 0.285 per cent. The maximum in samples from carefully covered tanks was 0.836 per cent and the minimum from poorly covered tanks 0.169 per cent. A relatively high specific gravity with a low nitrogen content shows that ammonia has been lost by evaporation.

Determinations of potash in liquid manure in 18 different cisterns showed variations in this constituent of from 0.50 to 1.24 per cent, the average being 0.79 per cent, with an average production of urine per cow of 39.4 cu. ft. Similar determinations of phosphoric acid showed variations in the case of four cisterns of from 0.006 to 0.008 per cent, average 0.007 per cent. Complete statistical data as to the methods of construction and covering of the cisterns, production of liquid manure, method of feeding, etc., with the analyses of the contents of the cisterns on 70 different farms, are given at the close of the report.

Experiments with liquid manure, especially as to loss of nitrogen during storage, R. K. KRISTENSEN (*Tidsskr. Landbr. Planteavl, 14 (1907), pp. 276–291, figs. 7*).—The experiments were conducted during 1906–7 largely according to the plan followed during the preceding year (E. S. R., 19, p. 218). The content of nitrogen and of ammonia was highest in the lowest portion of the liquid-manure tank in these trials as in the tests of the preceding year, there being a gradual increase from 0.197 per cent of nitrogen and 8.172 per cent of ammonia at 8.5 ft. from the bottom of the cistern, to 0.609 and 0.545 per cent of nitrogen and ammonia, respectively, 0.5 ft. from the bottom, while the

specific gravity of the liquid manure ranged from 1.0143 to 1.0229 at the two depths given.

Experiments on the storage of liquid manure in a round cistern 9.5 ft. deep and 17 ft. wide were conducted during a period of 8 months. The nitrogen content of the liquid during this period decreased from 0.447 to 0.350 per cent, a loss of 21.7 per cent. At the same time the specific gravity of the liquid went down from 1.0263 to 1.0241 (8.4 per cent). The loss in nitrogen is largely explained by the fact that there was an opening 3 in. wide and 6 in. long in the cover of the cistern, through which the pump projected.

Manure statistics, M. RINGELMANN (*Jour. Agr. Prat., n. scr., 14 (1907), Nos. 48, pp. 696–699; 49, pp. 718–723*).—This article gives detailed data regarding the manure produced by animals of different kinds with varying feed, litter, etc., as well as the weight per unit volume of manure managed in different ways.

Experiments with new nitrogenous fertilizers, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 22 (1908), No. 2, pp. 91–105, figs. 3*).—The experiments were made with two kinds of "Norway nitrate" (calcium nitrate from Notodden, Norway, containing 11.59 and 12.53 per cent of nitrogen respectively), and calcium cyanamid manufactured by three different processes, viz., those of Frank and Caro, Polzenius, and Carlson, these fertilizers containing, respectively, 18.76, 10.19, and 16.69 per cent of nitrogen. For the sake of comparison, experiments were also conducted with sodium nitrate or ammonium sulphate in the different series. Seven series of trials were conducted.

The calcium nitrate produced a somewhat higher increase in yield of potatoes and oats on a peaty soil than the corresponding amount of nitrogen in sodium nitrate. The results of the last three years' trials with this fertilizer by the author have thus agreed in showing that it is fully as effective as sodium nitrate for peaty soils low in nitrogen, as well as for other soils. The calcium cyanamid applied on sandy soils for potatoes, on a good peaty soil for timothy or potatoes, and for sanded white-moor soil, as a top-dressing on grassland, had a fertilizing effect of 60 to 80 per cent of that obtained with corresponding amounts of nitrogen in sodium nitrate. The two German cyanamids produced similar results, while the Swedish product in two series of trials was found to possess a somewhat lower fertilizer effect than the two other cyanamids.

Results of trials with nitrogenous fertilizers, 1907, H. G. SÖDERBAUM (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 1–2, pp. 104–110, fig. 1*).—Experiments were made with the following nitrogenous fertilizers: Calcium cyanamid, manufactured according to the Frank, Polzenius, and Carlson processes, sodium or calcium nitrate, and ammonium sulphate. The effect of the fertilizers for oats grown in sandy soil in glass cylinders of about 500 sq. cm. surface, holding about 25 kg. of soil) was studied, the fertilizers being added in the proportions of 0.25, 0.50, and 0.75 gm. of nitrogen per cylinder, with similar quantities of other fertilizing ingredients in all cases.

The results of the trials were remarkable in showing calcium nitrate decidedly inferior in its action to sodium nitrate, especially in the case of the heaviest applications, with ammonium sulphate much more effective than this fertilizer. No marked differences were observed in the case of the low and the medium applications of nitrogen for the three kinds of calcium cyanamid, these being all inferior in their action to sodium nitrate in the former case, and superior to it in the latter case. In the cylinders with the heaviest application of nitrogen, the Carlson cyanamid produced nearly as high results as ammonium sulphate, with the Polzenius cyanamid 12 per cent better than sodium nitrate, and Frank's cyanamid 12 per cent below. The abnormal climatic conditions of the season of 1907 are doubtless largely responsible for the

results obtained. The average temperature throughout the growing period was 2 to 3° C. below normal, and the vegetation period of the crop 111 days, against 88 days in 1906, 89 days in 1905, and 101 in 1904.

Tests of the new nitrogenous fertilizers on potatoes and turnips in 1907, L. Bauwens (*Jour. Soc. Cent. Agr. Belg., 55 (1908), Nos. 5, pp. 169–172; 6, pp. 191–193*).—These tests, which were made on sandy and clay soil, show that sulphate of ammonia and nitrate of soda were about equally effective, with possibly a slight difference in favor of the sulphate, which is attributed to the unusually favorable season. Calcium cyanamid and basic lime nitrate, although giving good results, were not quite as effective as the nitrate of soda and sulphate of ammonia.

On the efficacy of calcium cyanamid under different manuring conditions, I. Namba and C. Kanomata (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 631–634, pl. 1; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 549, II, p. 623*).—In pot experiments with oats, onions, and *Brassica chinensis* it was observed that lime nitrogen gave better results when used in connection with superphosphates than when used with neutral phosphate. It, however, does not depress the availability of bone dust, its action in this respect being similar to that of ammonium sulphate rather than to that of sodium nitrate.

Fertilizer experiments with phosphates on Finnish moor land, A. Rindell (*Finska Mosskulturför. Årsbok, 1906–7, No. 3, pp. 182–191*).—Experiments were conducted during 1903–1906 for the study of the effect of different phosphates—bone meal, Thomas slag, and Algiers phosphate—for oats and hay with and without liming. The relative value of the three phosphates for the growing of these crops on moor soils was as follows, for 50 and 100 kg. of phosphoric acid, respectively (Thomas slag=100) : Bone meal 118.1 and 111.7, Algiers phosphate 49.7 and 67.4. Simultaneous applications of lime hardly changed the effect of the Thomas slag, while it decreased greatly the effect of the bone meal, and especially that of the Algiers phosphate.

Comparative fertilizer experiments with high-percentage and low-percentage Thomas slag, Schweickert (*Landw. Ztschr. Rheinprovinz, 9 (1908), Nos. 11, pp. 146–148; 12, pp. 161–163*).—A series of experiments on meadows and with rye and oats are reported. The slags were used with and without the addition of lime. The general result was that the high-grade slag was as a rule more profitable than the low-grade.

On the value of refuse lime from sulphate-cellulose factories as an amendment on moor soils low in lime, H. von Feilitzen (*Svenska Mosskulturför. Tidskr., 22 (1908), No. 1, pp. 42–48, figs. 2*).—Pot experiments with red clover gave results indicating that this material can fully replace slaked lime on peaty soils low in lime if added in air-dry condition.

Gypsum as a manure, T. Takeuchi (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 583–597*).—Pot experiments with peas, beans, oats, rice, and spinach in which gypsum was used in connection with ammonium sulphate, sodium nitrate, lime nitrogen, potassium sulphate, and different forms of phosphoric acid are reported.

It was observed that as a rule gypsum decreased the yield when used in connection with acidic fertilizers and increased the yield when used with alkaline fertilizers. Gypsum therefore appears to be a valuable addition to fertilizers containing sodium nitrate or other substances which produce an alkaline reaction in the soil. If, however, acidic fertilizers such as superphosphate and ammonium sulphate are used gypsum is likely to decrease the yield.

It was also found in these experiments that gypsum exerts a favorable influence in overcoming the injurious effect on plants of an excess of magnesia in the soil. In case of spinach it was observed that applications of carbonate of

lime were injurious while the gypsum was beneficial provided the reaction of soil and of fertilizer was not acid.

Why are poor sandy soils often easily injured by liming? H. Yokoyama (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 615–617; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 549, II, p. 621*).—From pot experiments with oats the conclusion is drawn that the injurious effect of liming on poor sandy soils is due to the fact that an improper ratio of lime to magnesia is thus produced in such soils. It is recommended that in order to avoid such an unfavorable ratio these soils should be limed only with dolomitic limestone.

On the depression of growth by large doses of lime, C. Kanomata (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 599–607, pl. 1*).—The results of pot experiments with varying amounts of lime on a number of different crops are summarized as follows: "When the amount of lime is increased in undue proportion to the amount of magnesia present, the yield of oats is considerably depressed. In sand culture, there was a decrease of 39 per cent of the weight of shoots before flowering time, when the amounts of limestone and magnesite differed so much that the ratio of lime to magnesia was changed from 1 : 1 to 100 : 1.

"In soil culture the decrease was 48 per cent some time after the flowering, when that ratio was changed from 1 : 1 to 10 : 1.

"Corresponding observations were made with upland rice, barley, buckwheat, mustard, and onion. If by proper increase of magnesia in the overlimed sand again the ratio 1 : 1 is produced, there is again a considerable increase of yield.

"These experiments form an analogy to those of Maki and Tanaka who regenerated the overlimed soil by application of magnesium sulphate [E. S. R., 18, p. 14].

"It is certainly not the absolute amount of magnesite or of limestone which comes in consideration but the ratio of lime to magnesia which determines—ceteris paribus—the height of the harvest."

On the absorption of varying amounts of lime and magnesia by plants, T. Takeuchi (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 579–581*).—This article reports briefly the results of experiments made to determine the effect of varying ratios of lime and magnesia in the soil, upon the ratios of these elements in leaves, roots, and seeds of oats.

It was found that an increase of lime in the soil from 0.6 to 5 per cent resulted in a relative increase of lime from 1 to 2.1 in the roots and from 1 to 1.7 in the leaves. With a ratio of 1.2 parts of lime to 1 of magnesia the roots absorbed twice as much lime as magnesia, while the leaves contained 2.5 times as much lime as magnesia. By changing this ratio in the soil to 10 : 1 the ratio in the roots increased to only 1.7 : 1 and in the leaf to 1.5 : 1. This small increase, however, was accompanied by a considerable reduction in the development of the plant.

On the agronomical equivalent of artificial magnesium carbonate, S. Kanamori (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 609–612, pl. 1*).—From pot experiments with barley and oats the conclusion is drawn that applications of 0.1 to 0.6 gm. of magnesium carbonate are agronomically equivalent to 5 gm. of magnesite. A further increase of the magnesium carbonate, however, decreases the yield.

Top-dressing with magnesium sulphate, J. N. Sirker (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 613, 614*).—Pot experiments with barley are reported which show that top-dressing with 10 kg. per hectare (8.9 lbs. per acre) of magnesium sulphate increased the yield 31 per cent on soil containing an excessive proportion of lime to magnesia.

Manganese compounds as fertilizers for maize, W. F. Sutherst and H. Ingle (*Transvaal Agr. Jour., 6 (1908), No. 28, pp. 437, 438, pl. 1*).—This article briefly reviews investigations on this subject in Japan and Holland (E. S. R., 16, p. 43; 18, p. 434; 19, p. 523), and reports the results of pot experiments made by the authors with manganese chlorid, black oxid of manganese (pyrolusite), and manganese sulphate. All of the manganese compounds increased the yield, the most marked results being obtained with the pyrolusite. The benefit derived from the use of the manganese salts is attributed to their stimulating effect.

Do manganese salts stimulate plant growth? S. Rhodin (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 1–2, pp. 30–33*).—The author gives a brief discussion of earlier work done with regard to a possible stimulating effect of manganese salts on plant life, and describes experiments conducted by himself during the period 1902 to 1906. The results of these experiments were negative.

Modern niter beds (*Nature [London], 77 (1908), No. 2005, pp. 513, 514*).—This article discusses briefly the economic possibilities of the process proposed by Müntz and Lainé (E. S. R., 19, p. 524).

Crude ammonia, Sévegrand (*Rev. Vit., 29 (1908), No. 746, pp. 380–385*).—This article summarizes information regarding the value and use of this material as a fertilizer, weed destroyer, and insecticide. Of the three uses named the most important is as a fertilizer on account of the low price of nitrogen in the material.

On the manufacture and application of peat litter, A. E. Rautakoski (*Finska Mosskulturför. Arsbok, 1906–7, No. 3, pp. 192–207*).—A general account.

The extraction of potash from feldspathic rock, A. S. Cushman and P. Hubbard (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 779–797, figs. 7*).—This paper presents the results of a continuation of investigations which have already been noted (E. S. R., 18, p. 717; 19, p. 322), and deals especially with more exact studies of the influence of the fineness of grinding on the electrolytic decomposition of the feldspars. The results are summarized as follows:

"(1) Fine grinding of feldspar renders the potash partly available under the action of water. The addition of certain substances, such as ammonium salts, lime, and gypsum, increases this effect.

"(2) It is possible to completely extract potash by an electrolytic method either with or without the addition of hydrofluoric acid, but it is probable that this method could not be used commercially on account of its cost.

"(3) The effect of fineness of grinding has been studied and data given showing the relation of surface area to rate of decomposition.

"(4) It is shown that there are numerous fusion methods which could be used successfully if the cost were not too high. The attack on the silicates by means of potash or its compounds yields some interesting reaction products which might possibly be made use of.

"(5) The attack with hydrofluoric acid is suggested as a possible method that deserves further study."

The commercial fertilizer industry, Stange (*Vrtljschr. Bayer. Landw. Rat., 12 (1907), No. 4, pp. 503–518*).—Statistics of production and consumption of fertilizer materials of different kinds in the German Empire are briefly summarized.

The development of the superphosphate industry in Italy, Maizières (*Engrais, 23 (1908), No. 14, pp. 324–325*).—It is stated that the amounts of phosphates imported by Italy in 1907 for the manufacture of superphosphates were 338,000 metric tons from Africa and 92,000 tons from America.

Lime and its relation to agriculture, P. G. WICKEN (*Jour. Dept. Agr. West. Aust., 16 (1908), No. 2, pp. 130–134*).—This article briefly describes methods of burning lime, different forms of lime, and methods of application adapted to conditions in Western Australia.

Vegetable ash as a manure, W. GUERRERO (*Chem. Trade Jour., 42 (1908), No. 1090, p. 350*).—Attention is called to the beneficial effect of applications of ashes both as a direct source of plant food and as a means of rendering other fertilizing materials more available. The extensive use of ashes on the Continent of Europe is illustrated by the fact that 22,000 to 24,000 tons of ashes are used per annum in the olive industry alone.

Fertilizer and oil, M. C. MARSH and J. N. COBB (*U. S. Dept. Com. and Labor, Bur. Fisheries Doc. 632, p. 55*).—This is a brief note included in a report on the fisheries of Alaska in 1907, giving statistics of production of fish fertilizer and oil in that Territory. It is stated that there is only one fertilizer plant now in operation in Alaska. This is located at Killisnoo. The amount of fertilizer prepared during 1907 at this factory was "502 tons from herring, valued at $17,020, and 88 tons from salmon, valued at $2,980; while the oil extracted amounted to 80,877 gal. from herring, valued at $16,175, and 14,123 gal. from salmon, valued at $2,825."

Inspection of commercial fertilizers, P. F. TROWBRIDGE (*Missouri Sta. Bul. 80, pp. 3–14*).—This bulletin gives the results of inspection of fertilizers in Missouri during the spring of 1908. Analyses of 69 samples are reported. Attention is called to the fact that a large number of fertilizers failed to meet the guaranty of the manufacturers.

Analyses of commercial fertilizers, H. M. STACKHOUSE and M. B. HARDIN (*South Carolina Sta. Bul. 138, pp. 3–40*).—This is a report in the usual form of the results of the inspection of 744 samples of fertilizers collected during the season of 1907–8.

Comments upon the State fertilizer law, A. L. KNISELY (*Oregon Sta. Bul. 97, pp. 3–11*).—This law took effect June 1, 1907. It requires that all fertilizing materials (except land plaster and lime) selling for more than $5 per ton shall be sold under guarantied analysis, that the source of the fertilizing ingredients must be plainly stated on each package or lot, and that certificates must be filed with the experiment station, the director of which is empowered to enforce the law. Violations of the law are punishable by confiscation of the goods. A license fee of $20 for each brand is required.

AGRICULTURAL BOTANY.

Report of the department of botanical research, D. T. MACDOUGAL (*Carnegie Inst. Washington Year Book, 6 (1907), pp. 57–68, pls. 3, fig. 1*).—A summary is given of the investigations carried on at the botanical research laboratory near Tucson, Ariz., an outline of which has been previously noted (E. S. R., 18, p. 726). Among the leading investigations are studies of the advance and resession of vegetation in the depressed basins of the Colorado River and the inductive influence of physical factors on vegetation.

In the Colorado Delta a number of stations have been located where the advance and recession of plants will be studied. This region has been subject to recent overflow, and a sample of the water taken June 3 showed on analysis that it contained 364.8 parts soluble solids in 100,000. The proportions of sodium, chlorin, and sulphates are high, and the restoration of plant covering must be preceded by leaching and capillary action. Exact observations on the changes in the soil and vegetation are expected to offer evidence of value bearing on the distributional movements of plants.

In the investigations on the influence of physical factors on vegetation 4 stations have been located, one at the Desert Laboratory, a second on a small irrigated farm, a third at an elevation of 6,100 feet, and the fourth an alpine station at 8,000 feet. At these different stations observations are being carried on in which measurements are made of the factors which go to make up the climate of a region. It has been determined by the methods pursued that a meadow received 78,836 hour-degree units of heat in a year, while the floor of a hemlock forest near by received but 68,596 hour-degree units, indicating a season practically 11 days shorter than that in the meadow. In the application of this method to plants having a resting season the exposure is calculated from the time of planting the seeds until their maturity or until the attainment of some stage of development.

A number of correlated problems are under observation, some of which will be reported upon in the publications of the institution.

A new form of automatic rain meter is figured and described.

The physiological constant for the germinating stage of cress, F. A. Waugh and C. S. Pomeroy (*Massachusetts Sta. Rpt. 1907, pp. 71–80, dgms. 3*).—A study was made of the germination of cress to determine the physiological constant or the amount of heat required for the germination of the seed of this plant. These investigations have been carried on for some time at the station, and the authors have employed a recording thermograph in order to secure greater accuracy in the data.

During the period reported upon, 77 thermograph records were obtained showing the sum temperatures above 32°. In these records the sum temperatures varied from 2,714 to 4,286, and the time occupied for the completion of the stage of germination from 70 to 210 hours. By means of formulas the authors have determined the critical temperature of the germination phase of cress to be 38.2°. With this temperature known, the germination period of cress can be computed within rather close limits.

The transpiration current in plants, J. M. Janse (*Jahrb. Wiss. Bot. [Pringsheim], 45 (1908), No. 3, pp. 305–350, figs. 13*).—The author has made a study of the movement of water in plants, paying particular attention to transpiration. He claims that the movement of water in plants in so far as it is caused by transpiration is to be regarded exclusively as an isothermic operation for which all the energy is furnished by the temperature of the environment. If the leaf cells assist in moving the transpiration current, their effect is so small as to be only theoretical.

Molecular activities, such as capillary, imbibition, cohesion, etc., are incapable of promoting the water movement.

The course of the transpiration current is through the vessels when they conduct water only, the spiral vessels, even when containing air, and through the tracheids which are filled with water or which may contain air bubbles. In the case of the tracheids containing air bubbles, the water passes upward between the wall and the bubble, and it is probable that it filters sidewise into the next higher tracheid. Where the vessels are contiguous to the tracheids the water contained in them may enter the transpiratory current even if air bubbles are present, but then only by sidewise filtration from the vessels into the tracheids.

Where the vessels are separated from the tracheids by wood-parenchyma cells the water held in them can not enter the transpiratory stream directly, but it seems probable that it can act as a reserve supply when transpiration is suddenly increased.

The resistance encountered by the transpiratory stream under these conditions is so great that water can be moved for only relatively short distances.

The chemical nature of root secretions, J. Stoklasa and A. Ernest (*Jahrb. Wiss. Bot.* [*Pringsheim*], *46* (*1908*), *No. 1, pp. 55–102, pls. 5*).—Reviewing at some length the investigations on this subject, and summarizing their own experiments, the authors arrive at the general conclusion that the most important if not the only active agent excreted by roots is carbon dioxid, but that both carbon dioxid and organic acids are produced by soil bacteria in considerable amounts.

The structure of root tubercles in leguminous and other plants, W. B. Bottomley (*Rpt. Brit. Assoc. Adv. Sci., 1907, p. 693*).—According to the author, the root tubercles of all leguminous plants examined appear to arise endogenously from the cortical cells just outside of the endodermis of the roots. These cells are stimulated by the infection thread, which grows almost straight from the infected root hair toward the vascular cylinder of the roots, and a conical mass of cells develops which forms the young tubercle. In fully developed tubercles the bacteroid tissues are situated entirely within the vascular strands.

The root tubercles of alder, Elæagnus, and Cycas are to be morphologically considered as lateral roots, showing a central vascular cylinder and well-marked endodermis, completely surrounded by bacteroid tissues. These tubercles branch dichotomously and are perennial, thus differing from leguminous tubercles, which are of limited growth.

The assimilation of free atmospheric nitrogen through the fungus of Lolium temulentum, E. Hannig (*Ber. Deut. Bot. Gesell., 26a* (*1908*), *No. 3, pp. 238–246, fig. 1*).—By means of cultures of *L. temulentum*, in which fungus-infested seed and seed free from the fungus were used, the author has undertaken to determine the possibility of the assimilation of atmospheric nitrogen by this plant in symbiosis with the fungus.

It was found that the seed containing the fungus were considerably richer in nitrogen than those not so infested, but in the cultures comparatively little difference was shown in the growth of the plants from the different lots of seed. As a result of the analyses the author confirms the observation of Hiltner (E. S. R., 11, p. 1016) that there is a slight assimilation of atmospheric nitrogen by infested *L. temulentum*.

Heredity in plants and animals, T. B. Wood and R. C. Punnett (*Trans. Highland Agr. Soc. Scot., 5. ser., 20* (*1908*), *pp. 36–86, figs. 11*).—This is a discussion of Mendel's principles and their bearing on agricultural problems, the data discussed being drawn from investigations of Mendel, Hurst, Johannsen, De Vries, Bateson, Biffen, and others.

A critical review of the known cases of bud variation, P. J. S. Cramer (*Natuurk. Verhandel. Holland. Maatsch. Wetensch. Haarlem, 3. ser., 6* (*1907*), *No. 3, pp. XVIII+474*).—After a general review of the subject of variation, the author takes up and critically discusses a large number of bud variations and attempts to classify them according to their most striking characters.

Suggestions concerning certain bud variations, E. M. East (*Plant World, 11* (*1908*), *No. 4, pp. 77–83*).—The author gives an analysis of a number of bud variations of potatoes, tomatoes, and other plants, most of the variations being changes of color. In the majority of cases he holds that bud variation is simply a loss of a dominant character, and hence the appearance of a related recessive character. This he claims will explain fully 75 per cent of the recorded bud variations, and it is believed that an increasing knowledge of Mendelism will extend the proportion of cases to which it is applicable.

Variation in peas, F. A. Waugh and C. S. Pomeroy (*Massachusetts Sta. Rpt. 1907, pp. 65–70, dgms. 3*).—For several years past the horticultural division of the station has been carrying on investigations with peas to study the so-called

Mendel's law of variation and the application of statistical methods in studying variation and heredity. In the present report an account is given of the results of an examination of a row of peas in the field, in which the length of the vines, number of pods per vine and peas per pod, and length of vines to production of pods were determined, and the range in variation is shown. In connection with these studies the subject of correlation came up, and it was found that the length of vines and number of pods per vine were found to be closely correlated.

Gray's new manual of botany, B. L. Robinson and M. L. Fernald (*New York, 1908, 7. ed., pp. 926, figs. 1036*).—This is a seventh edition of the well-known manual of the botany of the central and northeastern United States and adjacent Canada, the area now covered being that between 48° north latitude and the southern borders of Virginia, Kentucky, Missouri, and Kansas, and from the eastern shores of the continent westward to the Dakotas and eastern Nebraska and Kansas, or to the parallel of 96° west longitude.

The material of the old manual has been rearranged and almost wholly rewritten, and in its preparation various specialists have revised different orders. The sequence of orders and genera is that of Eichler as elaborated by Engler and Prantl. The system of nomenclature is that adopted by the International Botanical Congress at Vienna in 1905. In order to make the manual as convenient as possible to the users, synonyms are freely inserted showing the equivalent names that are not sanctioned by the International Rules. The insertion of small text figures will aid the student at arriving at the determination of some of the more difficult species. In the present edition the Hepaticæ are omitted and the range is restricted in its western extension, but the whole number of species and varieties of plants treated shows a decided increase over previous editions, the actual number described being 4,885 as compared with 3,298 in the sixth edition.

Handbook of flowerpollination, P. Knuth, trans. by J. R. A. Davis (*Oxford, 1908, vol. 2, pp. VIII+703, pl. 1, figs. 210*).—This is the second volume of this work (E. S. R., 18, p. 128), and is based upon Müller's work on the fertilization of flowers by insects. The present volume gives observations on flower pollination made in Europe and in the Arctic regions. 1,686 species of 504 genera belonging to the natural orders Ranunculaceæ to Stylidieæ being reported upon.

FIELD CROPS.

A lesson in intensive farming, R. H. Forbes (*Arizona Sta. Bul. 57, pp. 267–274*).—In this experiment intensive culture was practiced between the rows of date palms in a newly established orchard 7.2 acres in size. The outcome is shown in the following table:

Financial results of intensive cropping on the basis of net cash returns to the small farmer.

Crop.	Acreage.	Marketable crop.	Gross receipts.	Expenditures.	Net returns.	Days labor.		
						Men.	Women and boys.	Team.
White Bermuda onions	0.47	3,916 lbs.	$73.24	$8.94	$64.30	31.5	0.5	1.0
Early Rose potatoes	.84	2,615 lbs.	70.00	12.85	57.15	42.0	----------	4.5
Dwarf tomatoes	.52	13,531 lbs.	624.60	72.72	551.88	85.0	38.0	10.0
Rockyford cantaloupes	1.00	780 doz.	144.60	9.00	135.60	31.0	8.0	2.0
Watermelons	.20	----------	15.65	2.00	13.65	3.0	----------	--------
Alfalfa	1.70	20 tons.	----------	22.41	--------	14.0	----------	9.0
Total	4.73	----------	928.09	127.92	800.17	206.5	46.5	26.5

The alfalfa, estimated to be worth $120, was fed to a team. By way of contrast it is shown that 110 acres of barley grown under extensive farming produced 138.8 tons of grain and 7 tons of barley hay, netting $12.21 per acre.

Report of the agriculturist, W. P. Brooks, E. S. Fulton, and E. F. Gaskill (*Massachusetts Sta. Rpt. 1907, pp. 29–57*).—Previous results of this series of experiments have been noted heretofore (E. S. R., 19, p. 226). The work was conducted on 318 field plats, 153 closed plats, and 330 pots in vegetation experiments.

The relative rank in value as sources of nitrogen on the basis of total yield of the materials under comparison in 1907 was nitrate of soda, dried blood, barnyard manure, and sulphate of ammonia. The average percentage basis for all results secured since 1890 is as follows: Nitrate of soda 100, barnyard manure 85.92, dried blood 70.21, and sulphate of ammonia 45.36.

The use of sulphate of potash gave larger crops of raspberries and blackberries than the use of muriate of potash, which was slightly the more effective in the production of cabbages, rhubarb, corn, and squashes. Asparagus gave much better yields where the muriate was used than where the sulphate was applied. In the production of marketable potatoes the potash salts under comparison ranked as follows: Low-grade sulphate, muriate, nitrate, high-grade sulphate, silicate, carbonate, and kainit, but the differences were relatively small except with the kainit. The plat treated with carbonate of potash was much more infested with scab than the plats receiving the other potash salts.

The plats receiving a special corn fertilizer supplying 42.6 lbs. of nitrogen, 180 lbs. of phosphoric acid, and 77.4 lbs. of potash per acre yielded 58.75 bu. of sound corn, 5 bu. of soft corn, and 6,580 lbs. of stover, while the plats receiving a fertilizer application supplying 47 lbs. of nitrogen, 50 lbs. of phosphoric acid, and 125 lbs. of potash produced 54 bu. of sound corn, 7.68 bu. of soft corn, and 6,890 lbs. of stover per acre. Plats of corn treated with manure alone gave a slightly higher yield of sound corn than plats receiving a smaller quantity of manure with a moderate amount of sulphate of potash which gave the higher yields of soft corn and stover.

In the experiments with different phosphates mixed hay was grown this season. The yields on the plats treated with the different phosphates varied but little. The plats which had received no phosphates during 11 years gave an average of about 4 tons to the acre for the first crop, while the highest yield obtained on any of the phosphate plats at first cutting was only 9,240 lbs. per acre.

The results of soil tests now in progress for 19 years show the great importance of a liberal supply of potash in growing corn.

In the test in which barnyard manure, wood ashes, and a combination of fine ground bone and potash is applied in rotation for the production of grass, the average yield per acre for this year was 5,005 lbs. of hay. The average yield for the 15 years the test has continued is 6,296 lbs. per acre.

In the experiment with winter and spring application of manure on a slope no manure was applied this year, but the crop of mixed grass and clover was extremely heavy and lodged considerably. The differences in yield between the two methods of application were small. Owing to a deficiency of rainfall, nitrate of soda applied for rowen did not repay the cost.

Seeding mowings, W. P. Brooks (*Massachusetts Sta. Circ. 16, pp. 8, figs. 3*).—This circular in discussing seeding down to grass or mixed grass and clover considers especially preparatory fertilization, time and methods of seeding, preparatory tillage, and the varieties of grasses and clover to be used.

[Early Amber sorghum and alfalfa], J. B. Lindsey (*Massachusetts Sta. Rpt. 1907; pp. 101–103*).—The results of 2 years' observations indicate that 50

to 60 lbs. of seed of early Amber sorghum per acre are sufficient when this crop is sown broadcast for forage.

Three cuttings from a one-sixth acre plat of alfalfa amounted to a yield of 3.65 tons of dry hay per acre in 1906. In 1907, nearly 4½ tons per acre were secured on the same plat.

Observations on nurse crops for alfalfa, V. A. Clark (*Arizona Sta. Bul. 57, pp. 284–287*).—In the fall of 1905 alfalfa was planted in pure culture, and with rye, wheat, barley, and oats as nurse crops. The following March the height of the plants in the pure culture was from 15 to 17 in., while in the nurse crops the alfalfa varied from 12 in. down, being generally not more than 6 or 8 in. high. The plants grown with nurse crops uniformly had few shoots as compared with those grown alone. The weights of 10 average alfalfa plants from the various plats were as follows: Pure culture, ordinary stand, 75 gm.; pure culture, stand too thick, 21.3 gm.; rye, two-thirds stand, 10.2 gm.; wheat, one-half stand, 12.5 gm.; wheat, full stand, 2 gm. Alfalfa roots in pure culture had reached a depth of about 18 in., when those grown with nurse crops had reached to a depth of only 12 in. These results were confirmed in a field test.

It was observed that the cereals grown as nurse crops or as intercultures did not tiller, making only one stem from each seed, while rye growing as pure culture stooled abundantly, one ordinary stool being found with 23 and another with 39 stalks.

Disk-harrowing alfalfa, R. H. Forbes (*Arizona Sta. Bul. 57, pp. 256–260, fig. 1*).—The principal benefits of disking alfalfa are enumerated as splitting and spreading the crowns, thereby causing new growth, destroying the egg deposits and larvæ of injurious insects, destroying weeds, and breaking up dense soils and especially the silt-blanket deposited by muddy irrigating water. It is estimated that disking will increase the average crop in Arizona 10 to 20 per cent.

Observations were made on the reduction of the yield resulting from the silt-blankets, which are often 3 to 4 in. thick. A field near Yuma showed a depreciation of 6.3 per cent in the second cutting, one near Phoenix of 9.7 per cent in the third cutting, and one near Solomonville of 27.6 per cent in the second cutting.

Alfalfa, R. S. Shaw (*Michigan Sta. Circ. 1, pp. 4*).—Notes are given relating to suitability of soils for alfalfa, and its cultivation, fertilizing, seeding, and harvesting.

Dodder in alfalfa seed, F. C. Stewart and G. T. French (*New York State Sta. Circ. 8, pp. 4, pls. 2*).—The injuries resulting from dodder in alfalfa seed are pointed out and directions for removing the dodder seed are given. For this purpose a wooden frame 12 in. square by 3 in. deep with the bottom covered with 20 by 20 mesh steel-wire cloth of No. 34 Washburn and Moen gage wire is recommended. When brass or copper wire cloth is used the wire should be No. 32 English gage. By shaking ¼ to ½ lb. of seed vigorously for ½ minute in this sieve the dodder seed may be separated from the alfalfa seed. If but little dodder is present one sifting will do, but if there is much dodder, especially of the large-seeded kind, two siftings should be made.

Culture tests with varieties of barley in 1905 and 1906, A. Boonstra (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1908, No. 3, pp. 75–118*).—In 1905 cooperative experiments were conducted with Landgerste, Goldthorpe, Primus, Princess, and Hannchen brewing barley, and in 1906 with only Goldthorpe, Princess, and Hannchen.

The results led to the conclusion that in the Netherlands the climate is a great obstacle to the production of good brewing barleys. The yield is seldom very high and most of the varieties are very flinty. Even after soaking the

grain the degree of flintiness is higher than is consistent with the quality of a good barley for brewing purposes. Much damage is also sustained by lodging, and in this particular the variety Princess was the least satisfactory, although in every other way the best variety tested.

Irrigation of barley, H. T. Nowell (*Wyoming Sta. Bul. 77, pp. 3–20, pls. 3, dgm. 1*).—The value of barley as a feed and for brewing purposes is discussed, and the results of experiments on the amount and method of applying water in irrigating barley are reported.

About 12 acres were divided into 6 plats and planted by a press drill with approximately 90 lbs. per acre of Chevalier brewing barley on May 9 and 10. The quantities of water used and the results are shown in the following table:

Quantity of water applied and results secured in growing brewing barley.

Plat No.	Area.	Number of irrigations.	Total depth.	Average depth per irrigation.	Length of irrigating season.	Yield per acre.
	Acres.		*In.*	*In.*	*Days.*	*Bu.*
1	1.267	0			0	1.97
2	1.297	1	8.41	8.41	1	6.31
3	2.339	2	10.83	5.42	24	19.13
4	1.947	3	19.56	6.52	43	35.32
5	2.363	4	26.29	6.57	46	20.96
6	2.289	6	34.67	5.78	43	30.58

Each application of water appeared very slightly to delay the growth of the crop, and this is thought as probably due to the lowering of the soil temperature through the use of cold water or to the displacement of the air from the soil as it becomes saturated.

The following table shows an approximate estimate of the complete cost of growing Chevalier brewing barley:

Estimate of cost and profit of growing brewing barley.

Plat No.	Water per acre.	Total cost per acre.	Cost of harvesting, thrashing, and hauling.	Total cost per acre.	Return per acre.	Profit (+) or loss (−) per acre.
1			$0.22	$6.07	$1.89	−$4.18
2	$0.22	$1.10	.71	7.66	6.06	− 1.60
3	.26	1.30	2.14	9.29	18.36	+ 9.07
4	.49	2.45	3.97	12.27	33.90	+21.63
5	.68	3.40	2.35	11.60	20.14	+ 8.54
6	.89	4.45	3.43	13.73	29.36	+15.63

In a series of experiments to compare the methods of irrigating barley one plat was laid out for irrigation by the check method, a second for irrigation by the furrow method, and a third was prepared for flood irrigation. Furrow irrigation used less water and maintained the surface soil in a much looser condition than either of the other methods. Under the check irrigation method and the flood method the surface soil had a tendency to bake to a hard crust. The initial cost of furrow irrigation was higher but the labor of irrigation less than with the other methods. It is recommended that the furrows be not less than 16 in. apart. At 8 in. apart the first cost is considered too large for the practical farmer.

Contributions to the biochemistry of barley, J. S. Ford and J. M. Guthrie (*Jour. Inst. Brew., 14 (1908), No. 1, pp. 60–87*).—The paper here presented

treats of the amylase of resting barley. The results secured by different investigators are briefly noted and the data obtained in experiments conducted by the authors are shown in tables and discussed. Brief details of isolated observations are given in a summary.

Ordinary aqueous extraction does not indicate the actual amount of amylase present nor does it show the relative amounts contained in the separated structural parts of the grain. When the entire seed is ground up and extracted the amylolytic activity observed is not considered a true measure of the ferment present but simply as indicating the resulting balance of limited solution and destruction. Although extraction by digestion with papain preparations in excess prevents to a great extent the destruction and facilitates the liberation of active ferment, it is regarded questionable as being a correct index of the latent or active amylase present.

A barley digested first with passive and then with active papain does not yield the same activity as when directly treated with active papain. A sample so treated gave an activity equalling 11.4 gm. of maltose per gram of barley as compared with 13.3 gm. by direct treatment. Treating barley with active papain after autodigestion lowered the activity as compared with direct proteolysis, the results of such a test being 10.4 and 14.6 gm. maltose per gram of barley. Even a short aqueous extraction destroyed some amylase and the action of water at higher temperatures caused rapid destruction.

The authors found a distinct increase in the amount of soluble nitrogen in autodigestions as compared with the amount found in an aqueous extract. In aqueous extracts of 2 barleys 28 and 30 mg. of salts, and in autodigestions of the same samples 42 and 46 mg. per 100 cc. were found.

Crude protein obtained from barley and treated with active papain showed no amylolytic activity. A test of the residue from an alcoholic extraction showed that considerable destruction had taken place as no active enzym was found present.

Edestin was extracted by a 10 per cent solution of sodium chlorid and precipitated by ammonium sulphate. The precipitate was redissolved in 10 per cent sodium chlorid and dialysed for some days against distilled water, and the separated edestin filtered off, dissolved in salt, and again dialysed to remove traces of soluble amylase. This edestin dissolved in a minimum of salt solution was partly treated with active papain and in part directly but in neither case was amylolytic activity observed. Crude translocation amylase precipitated from the first filtrate with 70 per cent alcohol was soluble in water and very active. After being dry for a few days it was no longer soluble in water but dissolved readily in the presence of salts and gave an active solution. The barley residue from the sodium chlorid solution exhibited a strong amylohydrolytic power when treated with papain.

The more violent chemical methods of differentiation of proteins are considered inapplicable in this connection. In general the results obtained indicate that the higher amylolytic activity as a result of papain treatment is due to liberation and solution of the colloidal ferment and to its protection from destruction.

Cotton culture, A. Veauvy and J. Coste (*Bul. Agr. Algérie et Tunisie, 14 (1908), No. 5, pp. 116–118*).—Abassi, Yanovitch, and Mit-Affifi Egyptian long-staple cottons were grown in Algeria. An average yield of 1,617 kg. per hectare (1,440 lbs. per acre) of seed cotton was secured. By taking this yield and the price offered for the cotton as a basis, it was found that the net returns amounted to 670.80 francs per hectare ($54.30 per acre).

Some conditions influencing cotton production, C. L. Newman (*South Carolina Sta. Bul. 140, pp. 3–31*).—This bulletin points out the principal conditions

to which the low average yield per acre of lint cotton is due, and reports the results of experiments with cotton by the station.

From about 40,000 stalks several hundred were selected as foundation stock, the seed from them being planted in 1907. The soil selected for the test, typical of the uplands of Anderson, Oconee, and Pickens counties of the State, was well prepared and fertilized and thorough level cultivation was given to the crop. Among 46 varieties the following ranked highest in yield of lint per acre: Toole 736.40 lbs., Cook Improved 622.27 lbs., Corley 620.81 lbs., Gold Standard 618.04 lbs., Big Boll White Seeded Prolific 598.82 lbs., Pride of Georgia 590.24 lbs., Columbia 589.22 lbs., Excelsior Prolific 539.92 lbs., Shank High 538.11 lbs., and Sunflower 533.28 lbs.

In percentage of lint Toole stood first with 40 per cent, followed by an unknown variety with 39 per cent, Evans and Reimproved Toole with 38 per cent, Brooks Improved, Pullnot, Cook Improved, Corley, and Gold Standard with 37.5 per cent, and Excelsior Prolific and Moss Improved with 36.2 per cent. The acre value of seed and lint of the varieties ranking highest as based on prices early in 1908 was as follows: Toole $110.45, Columbia $101.62, Sunflower $101.48, Cook Improved $98.08, Black Seeded Blue Ribbon $95.61, Pride of Georgia $94.45, Gold Standard $93.95, Accidental Hybrid $90.82, Corley $87.94, Big Boll White Seeded Prolific $86.57.

Estimates of the value of the cotton produced were given by three experts, and their statements are reported. Attention is called to the fact that grading as based on these reports would have increased the net returns by $18.66 per acre in one case and by $20 per bale in another.

It is pointed out that the highest acre value credited to one variety was $92.05 and the lowest $36.99, the varieties having been given the same treatment throughout. The highest and lowest yields secured from varieties of like characters in 5 years' trials showed variations from 448 lbs. to 171 lbs. of lint per acre, from 412 lbs. to 140 lbs., from 474 lbs. to 135 lbs., from 637 lbs. to 381 lbs., and from 736 lbs. to 469 lbs. It was also observed that a wide variation in the relative yields of the same varieties in different years often occurs. In a one-year test King and Peerless each gave 566 lbs. of lint per acre, whereas another year King gave 297 lbs. and Peerless 408 lbs. One year Bates Improved gave 164 lbs. more than Jackson Limbless, and in another 76 lbs. less. As these irregularities are not uncommon it is pointed out that one year's test can not prove or disprove the value of a variety. Ways and means for individual cotton growers to secure the best variety are discussed.

A study made by W. J. Roach of the susceptibility of varieties to anthracnose showed a variation from 24.4 per cent in the unknown variety to 2.7 per cent in Harden Prolific.

The nitrogen contents of Egyptian cotton, A. Schindler (*Jour. Soc. Dyers and Colourists, 24 (1908), No. 4, pp. 106, 107*).—Experiments with brown Egyptian cotton on the determination of nitrogen in raw cotton and in cotton after boiling in caustic soda of different strengths are briefly noted. The raw cotton contained from 0.250 to 0.256 per cent of nitrogen. By boiling in the caustic soda the nitrogen content was considerably reduced.

In a discussion of the article, E. Knecht reports further determinations showing that Grey American cotton yarn contained 0.138 per cent of nitrogen, Texas raw, cleaned cotton 0.150 per cent, and Red Peruvian 0.280 per cent.

The cultivation of potatoes, A. M. Soule and P. O. Vanatter (*Virginia Sta. Bul. 174, pp. 125–139, figs. 8*).—Variety, fertilizer, and selection tests are reported.

In 1906 the leading varieties and their yields per acre were as follows: Burbank 262.08 bu., Early Rose 258.53 bu., and Beauty of Hebron 243.36 bu.

Of these yields 230, 227.91, and 224.16 bu., respectively, were marketable. Of the very early varieties Bliss Triumph and Crown Jewel gave the best yields. In 1907, when the season was unfavorable, the best yielding varieties were Burbank with 132.5 bu., Early Rose with 112.91 bu., and Crown Jewel with 108.33 bu. of marketable potatoes. The average for both years showed Burbank in the lead with 181.25 bu., followed by Early Rose with 170.41 bu., Beauty of Hebron with 156.24 bu., Crown Jewel with 151.24 bu., and Gold Coin with 146.04 bu. Of the very early varieties Bliss Triumph led in yield with an average for the 2 years of 97.91 bu.

The influence of the time of digging was studied in 1906, when the crop was dug 80, 93, and 100 days after planting. The results showed that a delay of 21 days in the time of digging made an increase of 136.25 bu. per acre in the case of Beauty of Hebron, 126.25 bu. in the case of Burbank, and 118.75 bu. in the case of Early Rose.

On land where cowpeas had been plowed under and barnyard manure applied at the rate of 15 tons per acre an increase of 51.67 bu. was obtained. Barnyard manure and sulphate of potash at the rate of 100 lbs. gave an increase of 63.34 bu., while sulphate of potash alone at the rate of 100 lbs. gave an increase of 20 bu., high-grade acid phosphate at the rate of 300 lbs. an increase of 25.42 bu., and the sulphate of potash and acid phosphate combined an increase of 29.66 bu. per acre. A complete fertilizer gave an increase of 10.84 bu. in one instance and of 39.59 bu. in another. The best results were secured on the plats on which cowpeas were plowed under. On the other plats the crop followed spring oats and it was observed that these plats receiving barnyard manure produced a larger yield than where commercial fertilizers alone were used. This is considered evidence that the humus added through manure enabled the soil to retain moisture to better advantage.

Work in the improvement of the potato crop was undertaken in 1906 and 1907, and the results obtained showed clearly that some strains are from two to three times as prolific as others, and they indicate that both yield and quality of potatoes may be materially improved by selection. On the basis of the yielding power of the progeny of No. 29 a planting of 25 bu. per acre of this variety would equal 275.75 bu. per acre. Many potatoes produced only about 5 lbs. of tubers from each pound of seed planted and on this basis would yield only 125 bu. per acre. In connection with these tests it was observed that where the seed potato was cut into 2 pieces the number of marketable potatoes varied from 3 to 7 for each set planted, where cut into 3 pieces from 1.33 to 5.66, and where it was cut into 4 pieces from 2.50 to 7.25 potatoes.

The skin of different potato varieties and the influence of soil conditions, moisture, and fertilization upon the same, W. Kreitz (*Arb. K. Biol. Anst. Land u. Forstw., 6 (1908), No. 1, pp. 2–27, pls. 2, figs. 10*).—The results of different investigations on the potato and its diseases are reviewed, and the examination of different varieties grown on the experimental field of the Imperial Biological Institute of Dahlem is noted. In 1905, 23 different varieties were grown and measurements of the thickness of the skin and the cork cells were made and the form and size of the parenchyma cells and cell layers were studied.

It was found that the thickness of the potato skin is most readily determined by Tison's method. The skin thickness of individual varieties was not constant, but was apparently influenced by the location of the plant and climatic conditions. Under otherwise similar conditions a dry season produced a thinner skin than a season with adequate rainfall. Changing the locality of the plant also caused the skin thickness to vary, but when the varieties were brought back to the same kind of soil the differences in this particular soon disappeared.

It is stated that when a variety is grown for a considerable time on the same soil special strains with regard to skin thickness are developed, and when these are then grown on a different kind of soil this character is more or less lasting. Kainit, common salt, and nitrate of soda exerted an unfavorable influence, and superphosphate a favorable influence on the development of the skin.

The stone cells occurring in many varieties are not regarded as indicating a high degree of maturity, but as a variety characteristic pointing to the origin of the strain from a variety containing these cells or as being the result of hybridization. In order that thick-skinned potato varieties may be secured it is recommended that the seed be obtained from those localities in which varieties with thick skin have been grown for a considerable length of time. It was observed that on soils which produced thin-skinned potatoes the use of phosphoric acid as a fertilizer increased the resistance of the skin. In addition to the absolute thickness of the skin in determining its resistant quality, the arrangement of the cork cell layers is also of importance.

The influence of cross- and self-fertilization on the sugar content in the sugar beet, K. Andrlík, V. Bartoš, and J. Urban (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 7, pp. 373–387*).—In a series of experiments here reported the influence of cross-fertilization on the sugar content of the progeny was observed in numerous cases. The progeny of self-fertilized plants showed in part a tendency to degenerate, many individuals having yellow and red spots. The progeny of self-fertilized rich beets was lower in weight than the progeny from self-fertilized beets low in sugar. The beets resulting from cross-fertilization stood in average weight about halfway between the beets derived from rich and poor mother beets.

The essential mineral constituents of the sugar cane, T. Murakami (*Internat. Sugar Jour., 10 (1908), No. 112, pp. 172–175*).—A chemical study of sugar cane is reported.

The relative results indicate that the nitrogen content decreases and the total ash increases as the cane grows. Phosphoric acid and potash appeared to decrease per 100 parts of ash but were always constant per 100 parts of cane. The ratio of soda to potash was found to be constant. The only ingredients that increased were oxid of iron, alumina, sulphuric acid, and perhaps silica. A certain ratio was observed between lime and magnesia, but this varied slightly as the cane matured. The ratio between phosphoric acid and potash is determined as 1 : 26, which does not change during the growth of the plant.

The results further indicate that a maximum crop and a maximum sugar content are obtained on a rich soil in which the essential ingredients are distributed in an available form. It is recommended that lime be applied with nitrogen, phosphoric acid, and potash in order to maintain the proper ratio between lime and magnesia.

Cultivation of the sugar cane in Peru (*Internat. Sugar Jour., 10 (1908), No. 112, pp. 177–185*).—This article is a translation of a treatise on sugar cane culture in Peru by F. T. Sedgwick.

Virginia tobacco experiments, E. H. Mathewson, B. G. Anderson, and R. P. Cocke (*Virginia Sta. Bul. 175, pp. 145–171, figs. 9*).—These experiments are carried on cooperatively by the Bureau of Plant Industry of this Department and the Virginia Experiment Station. An earlier report on this work has already been noted (E. S. R., 19, p. 335).

The bulletin outlines a crop rotation for the dark tobacco belt of the State and reports the results obtained in an unfinished rotation. The succession of crops suggested is based upon tobacco as the leading crop, being followed by wheat, which in turn gives place to grass. After the grass crop corn is grown,

which is followed by cowpeas. This may be made a 5 or 6 year rotation by leaving the land in grass either 1 or 2 years.

As described in the previous abstract the tobacco grown received different quantities of fertilizers. In 1906, wheat after a highly fertilized crop of tobacco yielded 21 bu. to the acre, while after the tobacco fertilized with 400 lbs. of 3–8–3 fertilizer it yielded 8 bu. In 1907 the yield of wheat after a heavy fertilized crop of tobacco was 29 bu. per acre, and after a poorly fertilized crop only 12 bu. No fertilizer was applied to the wheat except that the fields were limed for the benefit of the succeeding grass crop.

In 1906 the wheat stubble was disked during the summer and a heavy seeding of grass sown September 3. One part of the field received a mixture of timothy, redtop, and clover, and another clover alone. April 5 a top-dressing of 300 lbs. of nitrate of soda per acre was applied just before a rain. Where the nitrate was used on the clover the yield of field-cured hay was 2.8 tons, and where it was not used 2.09 tons per acre. The increase in yield failed to pay for the nitrate applied per acre by $1.61. The mixed grasses receiving nitrate gave a yield of 5.06 tons per acre of first-class hay, while where the nitrate was not used the yield was only 3.3 tons. The hay was sold for $13 per ton, so that the gain from the use of the nitrate was $22.88 per acre, the cost of the nitrate being $8.

The successful points with grass in the dark tobacco district, as indicated by this work, are a fine mellow seed bed 2 or 3 in. deep, a heavy seeding of mixed grasses, and a liberal top-dressing with nitrate of soda in the spring. The corn and the cowpeas have not yet been grown, but from 40 to 60 bu. per acre of corn and 1 ton or more of cowpea hay are expected.

Notes are given on the home growing of tobacco seed, and the improvement of tobacco by seed selection and breeding.

Results of seed investigations for 1907. L. H. Pammel and Charlotte M. King (*Iowa Sta. Bul. 99, pp. 71–91, figs. 22*).—The results of analyses of seed samples sent in by farmers and others, and also of some purchased in the open market in 1907, are reported.

Of 134 samples of red clover examined the average purity was 96.6 per cent and the average vitality, grown in sand, 86 per cent. Medium red clover showed an average germination of 86.6 per cent in 41 samples examined, and 28 samples showed a purity of 99 per cent or more. In 14 samples of mammoth clover tested the average germination was 88.5 per cent. Ten samples had a purity of 99 per cent or more and 14 of 97 per cent or more. Five samples of white clover were all above 98 per cent in purity, with an average germination of 76.6 per cent. Alsike clover in 40 samples received contained impurities of 1.14 per cent on the average. The average vitality of all samples was 81.6 per cent. One sample had a vitality of 95 per cent, 5 of about 75 per cent, while some ran as low as 22 per cent.

The average vitality of 44 samples of alfalfa seed was 69.2 per cent and the average purity 91.1 per cent. The different samples ranged from 90 to 38 per cent in vitality. The impurities found in 44 samples of timothy were not very pronounced except in a few cases. The purity in 34 samples was 99 per cent or more and the average of all samples was 98.9 per cent. The purity of 21 out of 24 samples of flax ranged from 96 to 100 per cent. The average vitality in sand was only 66 per cent, but in the incubator the average rose to 98 per cent. The percentage of purity in 28 samples of millet was 95 per cent or more. In 3 samples it ranged from 85 to about 95 per cent, and in 2 samples it was under 85 per cent.

The purity of 7 samples of blue grass was 99.7 per cent, with an average germination of only 17 per cent. The percentage of germination in the best

sample was 70 per cent, while in the other 6 samples it was below 45 per cent. One sample of redtop examined had a purity of 99.8 per cent, and 3 samples of *Bromus inermis* had an average purity of 99.7 per cent and an average germination of 73 per cent.

A list of weeds reported as introduced with clover seed is presented and brief directions for removing noxious weed seeds from agricultural seeds are given. The results of purity and germination tests with seeds of garden and field crops by the station and other experiment and seed control stations are given in tables and briefly discussed.

Pure seed investigations, C. V. GREGORY (*Iowa Sta. Bul. 99, popular ed., pp. 3–14, figs. 22*).—This is a popular edition of the bulletin noted above.

Seed work, G. E. STONE (*Massachusetts Sta. Rpt. 1907, pp. 122, 123*).—During the year 359 samples of seeds were tested and separated, as compared with 231 in 1906. The average germination of onion seed for 1907 was 86 per cent, as compared with 79 per cent the year before. White pine seed had a germination of 59 per cent. Only 4 per cent was discarded from the best tobacco seed, as compared with 33 per cent for the poorest sample. From the best onion seed 1.6 per cent was discarded and from the poorest sample 43.3 per cent.

The development and organization of plant breeding in Denmark, Sweden, and Probstei, HOLTMEIER (*Landw. Jahrb., 37 (1908), No. 2, pp. 311–380*).—This article discusses the history, progress, and present status of plant breeding, especially that of field crops, in Denmark, Sweden, and the locality known as Probstei and situated in the eastern portion of Holstein in Germany, in the vicinity of Kiel. The area of Probstei is limited to only a few square miles, but seed growing has been carried on for so long a time and such good seed is produced that the locality has become very well known. The methods employed by prominent plant breeders are described and the particular varieties originated are mentioned. A bibliography of 24 references is given.

HORTICULTURE.

Experiments in drug plant cultivation, S. C. HOOD (*Vermont Sta. Rpt. 1907, pp. 371–386*).—An account with the results to date is given of experiments, conducted jointly by the Vermont Experiment Station and this Department during the seasons of 1903 to 1906, in the cultivation of several drug plants, including yellow dock, burdock, poppies, Seneca snakeroot, summer savory, digitalis, belladonna, sage, and several common herbs.

The results show that root drugs such as burdock and yellow dock can be profitably grown in Vermont providing the land is low priced. It was demonstrated that Seneca snakeroot can be successfully grown under cultivation. Belladonna fails to mature in the short season, and sage, digitalis, and lovage will not survive the winter even though they make a good growth the first season. The culture of such herbs as catnip, thyme, lobelia, pennyroyal, and of seed such as caraway, fennel, and coriander, is not likely to prove profitable. Although the cultivation of poppies for the capsules and seed is not considered promising for Vermont, it is believed that they may be successfully cultivated in the future for the direct production of morphin. Further work is to be done along this line. From fertilizer experiments and variety tests made, it appears that the production of strong healthy plants is more important for the morphin content than the use of large amounts of any particular chemical.

The Montreal market muskmelon industry, W. STUART (*Vermont Sta. Rpt. 1907, pp. 358–366*).—An account, based on the personal investigations of the author, is given of the muskmelon industry on the island of Montreal. The phases considered include cultural methods, size and types of melons, seed

saving, and style of package. With a view of ascertaining the possibilities of growing Montreal muskmelons in Vermont, experimental plantings were made at the station and by a cooperative grower in 1907. The work was unsuccessful from a commercial standpoint, but considerable information was secured which it is believed will lead to success in future work.

Tomato notes, W. M. MUNSON (*West Virginia Sta. Bul. 117, pp. 251–262, pls. 2*).—Popular notes treating of the history of the tomato, the development of modern forms, breeding new varieties, field culture, tomato growing in winter, and financial returns. The notes are based principally on observations made and data secured by the author in previous experiment station work.

Moisture and decay loss of Hubbard squash in storage, W. STUART (*Vermont Sta. Rpt. 1907, pp. 367–369*).—With a view to determining the amount of loss in storing Hubbard squash till midwinter, a ton, weighed as taken from the field, was stored on October 3 in a dry and medium warm room where the temperature was between 50° and 60° F. Moisture determinations were made at different intervals during the winter.

At the time of the final observations on February 3, 4 months from the harvest, the sound squash weighed 1,488 lbs., the total moisture loss was 20.8 per cent, and the loss from decay 4.8 per cent. When the squash were put in storage, they were wholesaling at a cent per pound. At the conclusion of the experiment the 1,488 lbs. of squash were sold for $53, an average of over $0.03½ per pound, the net gain by storage being $33 per ton. Although prices received that season were exceptional, it is concluded that squash properly grown and handled may be held in storage till midwinter or later with a reasonable assurance that the moisture and decay loss will be amply covered by the increased price received. Brief suggestions are given indicating conditions insuring minimum loss in storage.

Fruit list for 1908 (*Proc. N. J. Hort. Soc., 33 (1908), pp. 183–188*).—This list, revised by the executive committee of the New Jersey State Horticultural Society, shows the orchard and small fruits that are most satisfactory to growers for market and home use in the northern, central, and southern sections of the State.

Orchard survey of Wasco County, C. I. LEWIS and R. W. ALLEN (*Oregon Sta. Bul. 99, pp. 3–56, figs. 13*).—The station conducted orchard surveys in Wasco and Jackson counties in 1907, and the data secured in Wasco County, which comprises the fruit-growing districts known as Hood River, Mosier, and The Dalles, are given in the present bulletin.

The survey included every place having at least 4 acres in fruits. The phases reported on include climate and soil, elevation, general aspect, kinds and varieties of fruits, number and age of trees, planting distances, irrigation, drainage, cultivation, fertilizers, pruning, harvesting, packing, yield, selling price and cost of production, past and present condition of orchards, fungus diseases, and insect pests.

Apples, strawberries, pears, peaches, and cherries are grown in the Hood River district, although the first two fruits are the more generally grown. At The Dalles, the important fruits are peaches, cherries, and prunes, while grapes, apples, and pears are grown to some extent. At Mosier, apples and prunes are the leading kinds of fruit. The total orchard acreage of Wasco County was 7,598.7 acres, in addition to which there were 802.9 acres of strawberries and 100 acres of grapes.

Feeding the orchard, H. J. WATERS (*Missouri Sta. Circ. Inform. 22, pp. 32, pls. 3*).—A popular discussion based upon work conducted at the different experiment stations, with deductions and suggestions relative to fertilizing orchards in Missouri.

Tillage v. sod-mulch, U. P. Hedrick (*West. N. Y. Hort. Soc. Proc., 53 (1908), pp. 20–32*).—The New York State Station is conducting two experiments to determine whether an apple orchard will thrive and fruit better under tillage or in sod with the grass used as a mulch. This paper contains an account of one of these experiments, together with the results secured during the seasons from 1904 to 1907, inclusive. Introductory discussions are given of the objects of tillage and the philosophy of the sod-mulch.

In this experiment, which is to be conducted for a period of 10 years, the tilled plat was plowed in the spring and cultivated from 4 to 6 times, cultivation ending about August 1, when a cover crop of barley, oats, or clover was sown. On the sod-mulch plats the grass was cut once or twice during the season and allowed to lie where cut and decay into a mulch.

The results for the 4 years show an average yield per acre on the sod plats of 66.6 bbls., and of 91.3 bbls. on the tillage plats. The average expense per acre for the 4-year period was $15.78 for the sod and $22.18 for the tillage. Although no measurements were taken of the leaf area, inspection of the orchard showed that there were more and larger leaves on the tilled plat and the foliage was a darker and richer green. The mulched trees dropped their foliage about a week or 10 days earlier and the new wood produced was less than half that produced on the tilled trees and was less satisfactory in color. The size of the fruit averaged considerably larger on the tilled plats, while the number of fruits under both forms of culture appeared to be about the same. The mulched plats produced much more highly colored fruits, although the difference was not sufficient to bring any higher price in the general market. The fruit from mulched trees ripened from 1 to 2 weeks earlier than that from the tilled trees, and the difference in color was much less when the season was sufficiently mild to allow the fruit on the tilled plats to remain on the trees several days after that on mulched plats was picked.

The relative keeping qualities of the fruit from both plats was tested under the direction of G. H. Powell of this Department, who reported that the difference in the two methods of culture in this respect appeared to be more important with early maturing varieties such as Wealthy, Alexander, and Fameuse than with the slow ripening later varieties. With the early varieties the fruit from the sod land usually kept better than fruit picked from the tilled land at the same time, although there was practically no difference with well-colored fruit.

No difference was noted with reference to the eating quality of the fruit from the two plats. The causes of the differences noted with the two systems are further discussed.

Notes on the propagation of apples, F. A. Waugh (*Massachusetts Sta. Rpt. 1907, pp. 61–64, figs. 3*).—The station has conducted experiments on the propagation of fruit trees for several years with the two principal objects of determining the effects of stock on scion and the practical merits of different methods of propagation with special reference to the production of dwarf fruit trees. Three stocks were used, the Standard, Doucin and Paradise. Data are given showing the differences in growth of the Baldwin grafted on these three stocks and the variations are further indicated by diagrams. The average height and ratio of height to diameter was greatest where the Standard stock was used and least with the Paradise stock. These differences held with other varieties, including the Wealthy, McIntosh, Greening, etc., and agree with the common belief regarding the influences of the different stocks tested.

A study relative to the progressive increase of sugar and the corresponding decrease in acidity in the fruits of pears from the time of their formation to their maturity, G. Rivière and G. Bailhache (*Jour. Soc. Nat. Hort. France, 4. ser., 9 (1908), May, pp. 284–289*).—In a previous investigation

(E. S. R., 20, p. 241) the authors found that in the Chasselas Doré grape the sugar content increases and the acid content decreases progressively from the time of setting to the maturity of the berries. A similar investigation was conducted with 6 varieties of pears, the results of which are here tabulated and discussed. A portion of the fruit was bagged during the growing period and the remainder grew unprotected.

The sugar content was found to increase without interruption both in the bagged and unbagged fruit. The total sugar content of the pears grown in bags is somewhat higher than those grown without protection, the excess amounting in the case of the Passe-Crassane variety to 19 gm. per 1,000 parts of pulp. The investigation appears to demonstrate the value of growing table pears in paper bags to increase their sugar content. Bagging the fruit does not appear either to hasten or retard maturity. The acidity was found to decrease both with the bagged and unbagged fruit as the fruit approached maturity, although the bagged fruit showed a higher acid content at maturity than the fruit grown without protection. In all cases the density of the pears was found to decrease progressively throughout the period of development, approaching the density of water at maturity. The density appears to diminish in proportion to the increase in volume, and does not appear to differ materially in the bagged and unbagged fruit.

Manurial experiments with limes, R. H. A. A. Nicholls and F. Watts (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 2, pp. 73–76*).—This is an abstract of the authors' report on experimental plats in Dominica started in 1903 to determine the fertilizer requirements of lime trees. There were 5 plats included in the experiment, the control plat receiving no fertilizer. The results thus far indicate that the use of nitrogen and potash together increases the yield of fruit. The use of nitrogen alone improved the foliage but did not increase the yield. No conclusions have been deduced thus far relative to the use of phosphoric acid.

It is recommended in a general way that where limes are to be manured both nitrogen and potash, and probably phosphoric acid, should be employed and that care should be taken to maintain the supply of humus in the soil either by the use of pen manures or of green mulches.

Cacao manurial plots [in Dominica] F. Watts (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 2, pp. 53–71*).—A further report is given of the fertilizer experiments which have been conducted at the Dominica Botanic Station since 1900 (E. S. R., 18, p. 549), together with the results of fertilizer experiments conducted in several country districts.

As indicated by the yields for the past 5 years at the station, all of the fertilized plats have produced greater yields than the plat receiving no fertilizer. With phosphate and potash combined the annual yield of dry cured cacao was increased by 219 lbs. per acre, with dried blood by 187 lbs., and with a complete fertilizer consisting of phosphate, potash, and dried blood by 374 lbs. The mulched plat showed the greatest gain, with an increased yield of 402 lbs., and was also in the lead relative to the general health and growth of the trees and the soil texture. This plat is well covered by trees planted at the rate of 108 per acre, whereas the plat receiving no fertilizer required 178 trees per acre. The complete fertilizer plat was next in general health and condition as well as in yield. The results of the experiments in the country districts show the value of the phosphatic and nitrogenous fertilizers, but there appears to be little need of potash.

As a general result of these experiments planters are recommended to manure their cacao trees, giving preference to organic manures such as pen manure and liberal mulchings. Where these can not be obtained the use of fertilizers

containing nitrogen and phosphoric acid are advised, and it is further recommended that in many cases mulching be supplemented with moderate applications of nitrogen and phosphoric acid.

Small fruits in 1906, J. P. Pillsbury (*Pennsylvania Sta. Rpt. 1907, pp. 162–170*).—Tabular data with brief notes are given relative to the flowering and fruiting of a large number of varieties of strawberries, raspberries, blackberries, dewberries, currants, and gooseberries being tested at the station. Unpromising novelties and inferior varieties have been discarded from the test. The susceptibility of the different varieties to disease is also indicated.

Cranberry substations, W. P. Brooks (*Massachusetts Sta. Rpt. 1907, pp. 17, 18*).—As a result of the season's work the knowledge relative to cranberry insects has been greatly extended and the tentative conclusions reached as a result of the first year's work (E. S. R., 18, p. 954) have been in many cases confirmed.

The fertilizer experiments being conducted at Falmouth show thus far that nitrate of soda greatly stimulates the growth of vines and increases the size of the berries. Acid phosphate appears to favor early maturity of the fruit, accompanied apparently by decrease in size. Potash exercised the most favorable influence on the yield of fruit and appears favorable to the development of a bright color. The plats to which muriate of potash and acid phosphate were applied produced exceptionally solid, heavy, and fine appearing fruit. Lime appears to have been unfavorable to fruitfulness.

Through the vineyards of the Spanish Peninsula, M. Poirier (*Ann. Inst. Nat. Agron., 2. ser., 7 (1908), No. 1, pp. 135–183, figs. 6*).—A general account and discussion of viticultural conditions in the grape growing provinces of Spain.

Seasonal influence in carnation crossing relative to seed production, W. Stuart (*Vermont Sta. Rpt. 1907, pp. 355–358*).—Tabular results are given and discussed relative to limited studies made during the past 4 seasons. The results, which are in accord with those secured by Rudd (E. S. R., 16, p. 978), lead to the conclusion that crosses made early in the indoor season, as in November and December, give a considerably higher percentage of successes, a much larger number of seeds per capsule, and a higher percentage of germination than crosses made late in the season as in February. The author is of the opinion that the better results secured by early crosses are due principally to the greater vigor of the plants. The weather conditions also appear to be more favorable early in the season.

FORESTRY.

Georgia's forest resources, R. M. Harper (*South. Woodlands, 1 (1907), Nos. 3, pp. 4–23; 4, pp. 1–19; 5, pp. 3–19; 6, pp. 15–32, pls. 4, maps 13*).—A systematic catalogue of Georgia trees, showing the distribution and uses of each species as far as known. There are enumerated 134 species known to occur in Georgia and the probable occurrence of about 20 more is suggested. Introductory statements deal with the factors determining the distribution of forest types in Georgia and the natural subdivisions of the State, with the character of the forests of each. The text is accompanied with a series of maps showing the range of the more important species. The work is based upon previous botanical investigations in the State, together with extensive field investigations made by the author.

Report on an examination of certain swamp lands belonging to the State, W. W. Ashe (*N. C. Geol. Survey, Bien. Rpt. 1905–6, pp. 40–50*).—This report embraces the results of an examination of the most promising portions of

swamp timber lands in North Carolina. These lands are a part of 500,000 acres belonging to the State and held for the benefit of the public schools. Three areas lying in different portions of the coastal plain were selected for examination, comprising Angola Bay in Pender and Duplin counties, open ground of Carteret county, and Newport Pocosin in Craven county. These areas are described with reference to soil formation, topography, timber growth, etc., and recommendations are made for their future treatment.

Suggestions for arbor day planting, J. J. THORNBER (*Arizona Sta. Bul. 57, pp. 260–266, figs. 2*).—The successful trees which are commonly planted in southern Arizona, including extremely drought-resistant species, are enumerated, and attention is called to several desirable evergreen species for park and home planting, including the true cedars, the Monterey, Italian, and Arizona cypresses, the Chinese arborvitae, and two resistant eucalypts, *Eucalyptus polyanthema* and *E. rudis*.

The trees of Great Britain and Ireland, H. J. ELWES and A. HENRY (*Edinburgh, 1908, vol. 3, pp. VI+451–711, pls. 88*).—This is volume 3 of an extensive treatise which is being issued on the trees either native to or cultivated in Great Britain and Ireland (E. S. R., 19, p. 544). The arrangement of the present volume is similar to that of the previous volumes.

In part 1 the varieties and species of 16 genera are considered relative to their history, botany, distribution, cultural requirements, uses of the timber, etc. Descriptions are also given of specimen trees growing in Great Britain. Part 2 consists of illustrations and botanical drawings of the trees discussed in part 1.

Report on the forests of Kenia, D. E. HUTCHINS (*Colon. Rpts., Misc. [Gt. Brit.], No. 41, pp. 40*).—This report embraces the results of a study of the technical and climatic value of the Kenia forests in the East Africa Protectorate, and treats of the kind, quantity, quality, and accessibility of the timber, together with data relative to climate and labor, conditions of lease proposed for working the forests, and the climatic value of the forests as a source of water supply. It is estimated that there is approximately 1,000,000 acres of timber forests, as well as 600,000 acres of bamboo forests in this region. The timber has been valued at £23,000,000.

Edibles trees and shrubs, R. W. PEACOCK (*Agr. Gaz. N. S. Wales, 19 (1908), No. 2, pp. 101–114, figs. 25*).—An illustrative and descriptive account is given of a large number of edible trees and shrubs growing in the central portion of Australia. Many of these plants are extremely drought resistant and a valuable source of food for stock during droughty periods.

List of jungle products used by the poor during the famine, 1896–7, T. E. D. INNES (*Indian Forester, 34 (1908), No. 2, App., pp. 20*).—This list includes a large number of shrubs, trees, creepers, grasses, weeds, water plants, and fungi growing in the jungles of Balrampur which were utilized by the poor as a source of food during the famine of 1896 and 1897. Botanical names are given in most cases, together with notes showing how the different products were prepared for food and what portion of the plant was utilized.

The growth of pines raised from native and northern seed in the Eberswalde forest, DENGLER (*Ztschr. Forst u. Jagdw., 40 (1908), Nos. 3, pp. 137–152; 4, pp. 206–219, pl. 1*).—Comparative studies were made of 21-year old pine trees growing at Eberswalde and raised from native seed grown near Eberswalde as well as from seed grown in Finland, Russia, and Norway. Tabulated data are given showing the measurements of height, diameter, and stem growth, and specific density of the various trees studied, as well as on the complete canopy and branch development, foliage, and needle structure.

The data show the trees grown from northern seed to be far behind the native trees both in height and diameter growth, and that this difference is maintained from the early life of the trees. The development of the trees from northern-grown seed was also inferior to the native trees as regards the canopy and branch growth and the stem form. The wood of the foreign trees, however, showed a greater specific weight, the total foliage was less, and the needles were shorter but broader and thicker than with the native trees.

Breaking tests with twenty-one of the most important species of Surinam woods, together with notes relative to their botanical classification, characteristics, use, etc., E. K. Plasschaert and J. F. Ligtenberg (*Inspectie Landb. West-Indië, Bul. 11, pp. 29*).—Several tests were conducted with each species of wood, and the results are presented in tabular form showing both the moduli of rupture and elasticity. Comparative data are also given of earlier tests of several kinds of British-Guiana woods by the French marine engineer Dumonteil, as well as bending, shearing, and compression tests made with various specimens of woods at the State testing station at Brussels under the direction of E. Roussel.

Transverse tests of jarrah made at Sydney Technical College, J. Nangle (*Jour. and Proc. Roy. Soc. N. S. Wales, 40 (1906), pp. CI–CV, pls. 3*).—Tabulated results are given of tests made for moduli of rupture and elasticity on 20 pieces of West Australian jarrah. The test pieces were 2 in. square and in all but two cases 24 in. long. In most cases a 22 in. span was used. The tables show the breaking-load in pounds, failure under tension and compression, the duration of the test, rate of load applied in pounds per minute, and the moduli of rupture and elasticity, as well as the deflections under varying loads. Notes are also given on the author's exhibit of microscopic sections of Australian timber.

The relation of forests to stream control, G. Pinchot (*Ann. Amer. Acad. Polit. and Soc. Sci., 31 (1908), No. 1, pp. 219–227*).—The author discusses the increasing tendency of our streams to become less navigable both through soil erosion and lack of water, and outlines the engineering methods which are being tried to remedy this trouble.

It is believed that only by conserving and restoring the forest can the inland waterways become permanently improved. Experience and scientific investigation have shown that the two functions exercised by the forest in relation to stream flow are its tendency to reduce the difference between high and low water and its value as a surface protection against soil erosion. These two functions are discussed. Examples are given of typical streams flowing through forested and timbered watersheds, as well as of work being conducted by European countries in the reforestation of watersheds.

The sources of fumes in the Kingdom of Saxony and their influence upon forestry, F. Schröter (*Tharand. Forstl. Jahrb., 57 (1907), No. 2, pp. 211–430, maps 3*).—Investigations were conducted by the chemical division of the Tharandt Forestry Experiment Station in 1906, in continuation of previous work relative to the presence of sulphurous acid in the forest air and the injurious effects of fumes and gases on the trees. The present account is based upon this investigation and consists of a summary of the present scientific and practical knowledge dealing with the causes and effects of damage from fumes, together with a detailed account of the sources and extent of fume and gas damage in the various forest districts of Saxony. Remedial measures both from the standpoint of the forester and the industrialist, together with the various legal length.

The text is accompanied with a map showing the location of the industries liberating fumes and gases in Saxony, and indicating the extent of fume damage in various districts. A more detailed map is given of the forest district of Schwarzenberg.

Popular bulletins of the Swedish Forestry Association (*Skogsvårdsför. Folskr., Nos. 9, pp. 1–32, figs. 11; 10, pp. 1–32, figs. 11; 11, pp. 1–32, figs. 22; 12, pp. 1–32, figs. 14*).—These bulletins deal respectively with the following subjects: Forest Pastures, by C. Björkbom; Charcoal Burning, by E. Andersson; Draining in Forest Regions, by W. Ekman, and The Care and Utilization of Forests, by F. Aminoff.

A summary of the results of forest administration in Saxony for the year 1906 (*Tharand. Forstl. Jahrb., 57 (1907), No. 2, pp. 129–134*).—The summarized data given show the alteration in forest areas, the present condition of the domain funds, yields in timber and other forest products, and revenues and expenditures of various kinds, together with the net returns for the various forest districts to the secretary of agriculture for the year 1906.

Report on Norwegian forestry, 1906, M. Saxlund (*Indberetning om det Norske Skogvæsen. Christiania, 1908, pp. XVII+158*).—Report of the state forester to the secretary of agriculture for the year 1906.

Annual of streams and forests for 1908 (*Ann. Eaux et Forêts, 47 (1908), pp. 369*).—This annual contains the customary statistics complete to January, 1908, relative to the personnel of the forest administration of France and Algeria, together with a list of promotions from the national school of streams and forests and secondary school of professional instruction, and numerous statistical data relative to forest operations.

Review of forest administration in British India for the year 1905–6, S. Eardley-Wilmot (*Rev. Forest Admin. Brit. India, 1905–6, pp. 58, map 1*).—A summarized review of forest operations in the various provinces of British India for the year 1905–6, relative to alterations in areas, forest settlements, demarcations and surveys, the development of working plans, forest protection, sylvicultural operations, experimental work, and exploitation, together with a financial statement for the year.

Tabulated statements are given of all the important data, together with a map showing progress of forest surveys on September 30, 1906. During the year 713 sq. miles were added to the reserves, making a total of 233,651 sq. miles. Surveys were made of 3,608 sq. miles. The total number of square miles under working plans was 39,922. The cut of timber and fuel wood was 246,334,840 cu. ft., together with 210,173,780 bamboos and minor produce to the value of 5,512,819 rupees (about $1,764,100). There was a falling off in output of over 5,000,000 cu. ft. of timber and fuel, and of more than 5,000,000 bamboos from the previous year.

A table is given showing the gross revenue, expenditure, surplus, and proportion of expenditure to gross revenue of the previous 33 financial years. The gross revenue and surplus for 1905–6 are the highest recorded. The total value for the whole year was 30,170,666 rupees (about $9,654,500) and the surplus directly chargeable to revenue 17,919,178 rupees (about $5,734,100).

Annual report on the forest administration in Ajmer-Merwara for 1906–7, M. Prasad (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1906–7, pp. 40*).—The usual report relative to alterations in forest areas, forest settlements, working plans, forest protection, sylvicultural operations and exploitation, together with a financial statement for the year. The important features of the work are summarized in tabular form.

Progress report on forest administration in Coorg for 1906–7, C. McCarthy, (*Rpt. Forest Admin. Coorg, 1906–7, pp. 14*).—Data similar to the above are presented relative to operations in Coorg.

Annual administration report of the forest department of the Madras presidency, 1906-7 (*Admin. Rpt. Forest Dept. Madras, 1907, pp. 50+CXXVI +5*).—Data similar to the above are presented relative to forest operations in the northern, central, and southern circles of the Madras presidency.

Progress report on forest administration in the Punjab for 1906–7, C. P. Fisher (*Rpt. Forest Admin. Punjab, 1906–7, pp. 66*).—Data similar to the above are presented relative to the administration of the State forests in the Punjab.

Annual progress report of forest administration in the western and eastern circles of the United Provinces for the forest year 1906-7, W. H. Lovegrove and H. Jackson (*Ann. Rpt. Forest Admin. West. and East. Circles [India], 1906–7, pp. 120*).—Data similar to the above are presented relative to the administration of State forests in the eastern and western circles of the United Provinces.

Progress report of the Imperial Forest Research Institute for 1906–7 (*Rpt. Imp. Forest Research Inst., 1906–7, pp. 13*).—An outline is given of the progress made during the year 1906–7 in the various branches of forestry, including administration, investigation, and research, working plans, forest botany, zoology, and economics, together with a summary of revenues and expenditures for the year.

Forest service of Indo-China, G. Capus (*Bul Écon. Indo-Chine, n. ser., 10 (1907), No. 69, pp. 949–984*).—An account of the history, development, organization, direction, work, and purposes of the forest service of Indo-China.

Note on experimental rubber cultivation in the Bombay presidency, G. A. Gammie (*Proc. Agr. Conf. Ahmedabad, 1907, pp. 25, 26*).—Brief notes on cultural and tapping experiments being made by the Bombay presidency with *Cryptostegia grandiflora, Ficus elastica, Manihot glaziorii, Castilloa elastica,* and *Hevea brasiliensis.*

From the results thus far secured the author considers ceara rubber (*M. glaziorii*) the only rubber plant worth growing under general conditions in the Bombay presidency. It is believed that Cryptostegia may yield a little revenue as an adjunct to village resources.

Cultivation of rubber plants on the Malay Peninsula, E. Carle (*Bul. Econ. Indo-Chine, n. ser., 10 (1907), No. 67, pp. 761–782, figs. 4*).—An extract of a report on the rubber industry of the Malay Peninsula, in which some general information is given relative to the cultivation and production of rubber, tapioca, and lemon oil, together with a more detailed account of the production of Para rubber, including a study of the soils, methods of soil preparation, planting, planting distances, the condition of the trees, tapping operations and implements, the age at which the trees are tapped, yields, subsequent treatment of plantation enemies of Hevea and their control, labor, and value of plantations.

On the extraction of rubber from dried rubber plants, P. Alexander and K. Bing (*Tropenpflanzer, 12 (1908), No. 2, pp. 57–68*).—An account, together with tabulated results, is given of some extraction tests made with a view of determining the feasibility of producing rubber from dried rubber plant material. The material used consisted principally of the leaves, branches, bark, and wood of *Kickxia elastica* trees of various ages. The experiments showed that there was only an inconsiderable quantity of rubber in the material tested. The largest amount secured was with the bark of the 7 and 8 year old trees, from which 2.7 per cent of rubber was obtained.

Although the results were not satisfactory, it is suggested that greater rubber returns may be procured from similar tests with other rubber-producing species.

DISEASES OF PLANTS.

Report of the botanists, G. E. Stone and G. H. Chapman (*Massachusetts Sta. Rpt. 1907, pp. 120–150*).—An outline is given of the investigations carried on during the season, particular attention being paid to the study of mosaic diseases of tobacco and other crops, the testing of banding substances for trees, investigations of tomato rot, spraying experiments with potatoes, and a study of the meteorological conditions affecting plant diseases and the development of crops. A brief report of seed investigations is noted on page 335 of this issue.

Among some of the diseases investigated, attention is called to an apparently new fungus trouble affecting asparagus. This is due to a species of Fusarium, and when attacked the young slender shoots are rotted off near the surface of the ground. A disease of peonies has been under observation for some time, but while microscopic examination of the material has shown fungi, bacteria, and nematodes present, they are apparently secondary or accompanying factors of decay. Further investigations are being conducted on this disease.

In experiments with fungicides for the control of diseases of potatoes, Bordeaux mixture and Paris green were tested in comparison with Bordeaux mixture and Disparene, Bordeaux mixture and sodium benzoate, soda Bordeaux mixture and Paris green, and copper phosphate and Disparene. Three applications of the fungicides were made to all the plats. The results showed that soda Bordeaux and Paris green proved the best in reducing the amount of disease, with Bordeaux mixture and sodium benzoate a close second in effectiveness. Bordeaux mixture and Disparene seemed to produce fairly good results and held the blight and insects in check, but did not prove as efficient as either of the other two fungicides. Bordeaux mixture and Paris green did not seem to hold disease in check as well as the others, but was productive of good results, while copper phosphate and Disparene seemed to have no appreciable effect on checking disease, so far as the results of this year's work were concerned.

The influence of various potash salts on potato scab was tested, potatoes being fertilized with 7 different potash compounds and grown in plats previously planted to potatoes and in which the scab organism had become more and more troublesome. Of the forms of potash used, kainit, sulphate, muriate, nitrate, and silicate of potash gave little increase in the development of scab, while the plats receiving carbonate of potash were badly affected by the disease. As the seed tubers in every case were treated with corrosive sublimate before planting, the results obtained showed that this treatment is of little value when the soil conditions are especially favorable for the scab fungus.

Work on the mosaic disease of tomatoes and tobacco was begun at the station in 1907, but it was too late in the season to observe the seed beds and the transplanting of field-grown tobacco, and the work was confined largely to verifying the results of previous investigators. During the coming year the work will be renewed and the disease studied under field conditions. In connection with field work, experiments will be carried on in the laboratory to determine the effects which different enzyms have on the production of the disease.

Tomatoes are especially subject to the mosaic disease, particularly when grown under glass, and healthy and diseased leaves of tomato plants grown

under such conditions were examined for the presence of catalase. Both the α and β forms of catalase were present in the tomato leaves, although there appeared to be a decided deficiency of insoluble catalase in the leaves of the tomato when affected with the mosaic disease.

A study was made to determine the effect of light, heat, and moisture as factors in the susceptibility and immunity to disease.

The occurrence of plant diseases in 1907, N. J. Giddings (*Vermont Sta. Rpt. 1907, pp. 328–334*).—Notes are given on a number of plant diseases which were under observation during 1907. These include several diseases of potatoes, some orchard diseases, and diseases of garden crops.

Among the diseases of garden crops not hitherto reported was a muskmelon rot which developed toward the close of the season and caused considerable loss. The rot usually appeared on the lower side of the fruit, and when attacked the interior flesh was completely decayed around the point of infection and possessed a disagreeable odor. An examination showed that the disease was due to bacteria. The organisms were isolated and transfers and inoculations made, the inoculations resulting almost always in complete decay of the fruit within from 3 to 5 days. In addition to muskmelons, the organism, which is a wound parasite, seems to be able to infest cucumbers, but the action is much slower, only about one-third of those inoculated giving evidence of the disease.

Report of the vegetable pathologist, D. McAlpine (*Rpt. Dept. Agr. [Victoria], 1905–1907, pp. 26–37, figs. 12*).—This is a brief account of the various investigations carried on by the author during the period covered by the report, and includes notes on flax rust, alfalfa rust, flag smut of wheat, potato scab, brown spot of potatoes, etc.

In the investigations with flax rust a decided difference in susceptibility to disease was noted, Russian and Japanese flax apparently being quite free from the fungus, while plants grown from Calcutta seed were almost entirely destroyed.

The flag smut of wheat (probably due to *Urocystis occulta*) is said to be a serious disease, and in certain districts of Victoria considerably reduces the yield in seasons favorable for its development. Pot experiments were conducted to determine the manner in which this smut is carried over from year to year, and it was shown that the smut developed only when the seed was dusted with spores, indicating that it is through the young seedlings that the attack is made and that there is no infection through the above-ground parts of the plant.

An account is given of successful experiments in the prevention of potato scab through the treatment of the seed with corrosive sublimate. Notes are also given on a disease of potatoes called brown ring, which is particularly liable to occur in the variety Beauty of Hebron, and on brown spot. The cause of neither of these diseases is definitely known.

Rusts of cereals and other plants, E. W. Olive (*South Dakota Sta. Bul. 109, pp. 3–20, figs. 5*).—The life histories of a number of the more common species of rusts are described and attention is called to the losses due to the presence of these fungi, particularly upon cereals. Suggestions based on life history studies are given concerning means by which the losses may be greatly reduced.

Cotton wilt in the Central Provinces, G. Evans (*Agr. Jour. India, 3 (1908), No. 1, pp. 78–80*).—The presence of cotton wilt, due to *Neocosmospora vasinfecta*, on the experimental farm at Nagpur is noted. A local variety, Bani, of rather fine staple was first attacked, the signs of the disease appearing toward the end of August, and the attacked plants often being completely destroyed within 24 hours.

An examination of the diseased material showed that it was due to the above-named fungus. A number of other Indian varieties were attacked to a greater

or less extent, but American upland varieties growing around the edge of the infected plats were not attacked, nor was any instance found in which the American cotton was suffering from the disease.

Upon an extended inquiry it was found that this disease had been noticed occasionally for the past 3 or 4 years, but only became serious during 1907. All replies to inquiries indicated that only the Indian varieties were attacked.

The presence in Germany of Pseudoperonospora cubensis tweriensis, a parasite of cucurbits, R. EWERT (*Internat. Phytopath. Dienst (Beigabe Ztschr. Pflanzenkrank.), 1 (1908), No. 1, pp. 8–11*).—The author reports the presence in several localities in Germany of a form of the cucurbit mildew, which was described a few years since by Rostowzew as occurring in Russia. This form of the mildew differs from the species in the larger size of the conidia.

Leaf spot disease of eggplants, P. VOGLINO (*Malpighia, 21 (1907), No. 7–8, pp. 353–363, pl. 1*).—The author claims that the form of leaf spot, to which the name fumagine is sometimes given and which has been variously reported as caused by *Phoma solani* and *Phyllosticta hortorum*, should be referred to *Ascochyta hortorum*. To this species should also be referred *Ascochyta lycopersici*, *A. solanicola*, *A. atropæ*, *A. alkekengi*, *A. physalicola*, and possibly *A. pinzolensis*.

The spores of *A. hortorum* germinate readily in moisture on the leaves of the eggplant, tomato, other species of Solanum, such as *S. nigrum* and *S. dulcamara*, and on *Physalis alkekengi*, *Datura metal*, and *Atropa belladonna*.

In their morphological characters there is a close agreement between *A. hortorum* and *A. pisi*, but from inoculation experiments they seem to be biologically distinct.

Potato spraying experiments, L. R. JONES and N. J. GIDDINGS (*Vermont Sta. Rpt. 1907, pp. 334–342*).—Experimental trials with fungicides upon potatoes have been carried on at the station for the past 17 years. Those in 1907 were designed particularly to determine the relative gain from spraying potatoes with Bordeaux mixture and Paris green, comparing the results from 2, 3, and 4 applications, and the relative gains from the use of commercial compounds, such as Boxal and Bug Death, as compared with Bordeaux mixture and with Paris green.

The experiments with 2, 3, and 4 applications of Bordeaux mixture and Paris green gave results that were in the main in harmony with those obtained in previous years' investigations. The 2 applications of Bordeaux mixture made in August proved less efficient in checking the flea beetle and early blight than where other applications were made, particularly the spraying made early in July. The increase in marketable tubers for the sprayed over the unsprayed lots varied from 52 to 172 per cent.

In experiments in spraying late potatoes with Bordeaux mixture the results were similar, although the season was apparently not one in which large crops were obtained. A tabulation is given showing the average gains due to spraying obtained for the last 17 years as 113 bu., or 68 per cent increase per acre.

The experiments to test the value of Boxal and Bug Death, showed that neither was any improvement over a freshly prepared Bordeaux mixture to which Paris green was added. Both the proprietary compounds had insecticidal and fungicidal value, but they were more costly and less efficient than the Bordeaux mixture.

A new tomato disease, H. T. GÜSSOW (*Jour. Bd. Agr. [London], 15 (1908), No. 2, pp. 111–115, fig. 1*).—An account is given of a disease of tomatoes caused by *Septoria lycopersici*, which until 1907 had been unreported in England. During that year the entire crop was destroyed in one of the principal tomato districts of England.

The characteristics of the disease are pointed out, and the author recommends early spraying with a 3 per cent solution of Bordeaux mixture, the cutting out and burning of all diseased plants, and the use of lime in the soil and scattered about the stems.

Experiments on the control of gooseberry mildew, A. Vasilev (*Zhur. Bolyczni Rast., 1 (1907), No. 3–4, pp. 103–105, German Summary, pp. XIX, XX*).—A brief account is given of the successful use of potassium sulphate for the control of the gooseberry mildew (*Sphærotheca mors-uvæ*).

Fruit tree diseases and fungicides, F. M. Rolfs (*Missouri Fruit Sta. Bul. 16, pp. 3–39*).—An account is given of various fungus diseases which are common to cultivated fruits in the Ozark region of Missouri together with directions for most efficiently and economically combating them. The diseases are grouped according to the host plants, and a bibliography is given of some of the more important station and Departmental publications relating to them. While most of the remedies suggested consist of spraying with fungicides, attention is called to the fact that spraying is merely preventive, and that in order to be effective it must be thoroughly done.

Notes on a cherry disease in Western Germany, R. Ewert (*Proskau. Obstbau Ztg., 13 (1908), No. 1, pp. 2–8, fig. 1*).—An investigation has been made of a disease of cherry trees which has proved quite destructive in the Rhine provinces. Other investigators have attributed the loss to attacks of *Cytospora rubescens* or *Valsa leucostoma* (E. S. R., 15, p. 270).

The author claims that the main cause of the trouble is due to the planting of cherry trees in unsuitable soils and locations, resulting in an unfavorable growth, and that the fungus attacks the trees only after they have been weakened by the environmental conditions. Just what conditions of soil, moisture, and exposure are best adapted to the growth of cherry trees have not been determined, and investigations are desired along those lines.

Preliminary report on dust spraying experiments in Georgia, W. W. Chase (*Ga. Bd. Ent. Bul. 25, pp. 129–135*).—A preliminary account is given of tests of 4 dust fungicides for the control of brown rot of peaches. Directions are given for the making and application of these compounds, and, so far as known, the formulas for preparation are given.

The different dust sprays were applied to 3 varieties of peaches, but, so far as testing the fungicidal value was concerned, the experiments proved a failure, as there was no rot developed on any of the trees. The season was an exceptionally dry one and the conditions were unfavorable for the development of rot, even on the untreated trees. As shown by the defoliation of the trees and the effect on the fruit, marked variations in susceptibility to the treatment were indicated between different varieties. Some difference was also noted in the effect of the various compounds themselves.

The cocoanut stem disease, T. Petch (*Trop. Agr. and Mag. Ceylon Agr. Soc., 30 (1908), No. 3, pp. 285–289*).—The author reviews the conditions surrounding the stem disease of cocoanut palms, which he claims is of fungus origin (E. S. R., 19, p. 1051).

One of the most prominent symptoms of this disease is the bleeding from decaying tissues. The results are given of inoculation experiments with spores from cultures, as well as material from diseased trees, showing that the disease is rapidly transmitted. Where cultures of the fungus were used, there was no bleeding from the wounds at the end of 3 months, but when the infected spots were cut open it was found that the disease had spread over an area of about 12 sq. in., and the bleeding began in another wound a little later.

The disease does not seem to attack old trees, the stems of which have become hard, and in combating it on young trees the author recommends

spraying with Bordeaux mixture. The cutting out of diseased tissues and the scorching of the wounds, after which they are covered with hot coal tar, has proved successful in a number of instances.

The biology of Polystictus versicolor, JESSIE S. BAYLISS (*Jour. Econ. Biol., 3 (1908), No. 1, pp. 1–24, pls. 2*).—A study of bilology of *P. versicolor* is reported and the fungus is said to be a pure saprophyte, whose natural habitat is moist dead wood. The author has found it growing on *Quercus robur*, *Fraxinus excelsior*, *Pyrus aucuparia*, *Salix alba*, *Betula alba*, *Pyrus malus*, *Ligustrum vulgare*, and *Crataegus oxyacantha*, and has been able to infect without difficulty small blocks of *Fraxinus excelsior*, *Ulmus campestris*, *Prunus avium*, *Alnus glutinosa*, *Acer pseudoplatanus*, *Æsculus hippocastanum*, and *Betula alba*. She has also successfully cultivated the fungus from spore to spore. It seems probable from the investigations reported that it will grow on almost any kind of wood except that of conifers.

The spores and their germination are described, after which an account is given of the method by which the destruction of wood takes place. The chemical changes seem to indicate that it attacks and destroys the wood gum, which constitutes a large percentage of the wood of most trees except conifers.

The sporophore of the fungus and the relations of the fruiting body to light, gravity, etc., are described, and attention is called to the fact that under natural conditions the pileus lasts but a comparatively short time, being specially subject to the ravages of a small beetle. The spores retain their vitality for a considerable period even when dried or when exposed to high or low temperatures.

In connection with the investigations the author made the usual tests for enzyms and demonstrated the presence of laccase, rennetase, cytase, invertase, diastase, coagulase, ereptase, and a fibrin-digesting protease. Only negative results were obtained on testing for emulsion, lipase, maltase, and hadromase.

The chestnut canker, W. A. MURRILL (*Torreya, 8 (1908), No. 5, pp. 111, 112*).—A brief account is given of the author's investigations on the occurrence and spread of the chestnut canker, caused by *Diaporthe parasitica* (E. S. R., 19, p. 250), and it is stated that the disease is spreading rapidly. The author claims that not only the native species of chestnut, but also the European and Japanese, which are frequently planted in this country, are subject to attack.

Experiments in pruning trees have shown that this is futile as a means for preventing the further spread of the disease. At the present time the author thinks that planting any species of chestnut in an affected area would be attended with great risk. The owners of chestnut timber are advised to make use of their timber at once, thus clearing the woodlands of the sources of infection and giving young trees of other varieties opportunity to develop.

The bleeding and yellowing of poplars, J. W. BLANKINSHIP (*Ztschr. Pflanzenkrank., 18 (1908), No. 1, pp. 26–28*).—Further notes are given on 2 diseases of poplars termed by the author bleeding and yellowing, of which preliminary accounts have already been given (E. S. R., 17, p. 451). These diseases are said to attack various species of poplar, particularly *Populus angustifolia*, *P. balsamifera*, *P. trichocarpa*, and *P. deltoides*.

The principal characteristic of the bleeding is the exudation of sap from the wounds in the affected tissues. This disease the author believes is due to bacteria, since the sap is full of bacteria, and the inner wood cells of diseased tissues are also found filled with them. Cultures have been made of these bacteria, but further investigations are needed to determine whether the bacteria are the cause of the disease, and also the rôle of ants and flies in its distribution.

Associated with the bleeding disease is another, which is called the yellows or yellowing. This disease has been attributed to an increase in the alkali content of ground water following continued irrigation. The bleeding disease may attack a few twigs of a tree, while the yellowing affects the entire tree and causes its destruction much more quickly than the bleeding.

The author believes that the diseases are due to different causes and that the bleeding may follow a weakened condition caused by the yellowing disease.

Cutting out diseased twigs and coating the fresh wounds with tar or paint is recommended for the prevention of the bleeding disease. If the yellowing disease is due to the presence of alkali, drainage would doubtless correct this trouble.

The damping off of coniferous seedlings, L. R. Jones (*Vermont Sta. Rpt. 1907, pp. 342–347*).—The damping off of coniferous seedlings is said to be a serious hindrance to success in raising seedlings of pine or other conifers in the nursery, and was the cause of considerable loss experienced in 1906 and 1907. Examinations made of plants from local seed beds showed the presence of a Fusarium-like fungus similar to the one described in Europe as parasitic on pine and spruce seedlings. The author thinks, from the circumstances surrounding the location of the seed beds, etc., that the fungus not only is a widespread one, but also is probably a native rather than an introduced species.

In order to determine what could be done to check the loss, investigations were carried on on methods of handling seed beds, sterilization of the soil, and the use of fungicides during certain periods of growth. The investigations showed that the surface of the seed beds should be kept as dry as practicable. It early became apparent that the fungus content of the soil at the time of planting is an important factor, and experiments were carried on in sterilizing the soil by the use of a 1 per cent and a one-half per cent solution of formalin, the seeds being sown 5 days after the application of the fungicide. As a result of the spraying with the one-half per cent formalin solution the stand was reduced by 25 per cent as compared with the check lot, and where the one per cent solution of formalin was used the stand was reduced by nearly the 1 per cent solution of formalin was used the stand was reduced by nearly the treated and untreated lots, practically 90 per cent of the seedlings where no formalin was used having been destroyed, while only 7½ per cent were damped off where the 1 per cent solution was used and 9 per cent where the one-half per cent solution was used.

The possibility of the control of this disease by the application of fungicides during the critical period is being investigated.

The sprinkling of the surface of the seed bed with sand immediately following germination was tested, and was found to be quite efficient in lowering the amount of loss. In this case clean sand, of rather coarse texture, should be used and applied as hot as it can be handled, sprinkling it over the surface of the bed to a depth of about $\frac{1}{16}$ in.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Deer farming in the United States, D. E. Lantz (*U. S. Dept. Agr., Farmers' Bul. 330, pp. 5–20, figs. 2*).—This bulletin discusses briefly the economic possibilities of raising deer and elk in the United States.

"The wapiti and the Virginia deer can be raised successfully and cheaply under many different conditions of food and climate. The production of venison and the rearing of both species for stocking parks may be made profitable industries in the United States.

"Instead of hampering breeders by restrictions, as at present, State laws should be so modified as to encourage the raising of deer, elk, and other animals as a source of profit to the individual and to the State.

"Safeguards against the destruction and sale of wild deer in place of domesticated deer are not difficult to enforce. For this purpose a system of licensing private parks, and of tagging deer or carcasses sold or shipped, so that they may be easily identified, is recommended.

"It is believed that with favorable legislation much otherwise waste land in the United States may be utilized for the production of venison so as to yield profitable returns, and also that this excellent and nutritious meat, instead of being denied to 99 per cent of the population of the country, may become as common and as cheap in our markets as mutton."

Silver fox farming. W. H. Osgood (*U. S. Dept. Agr., Farmers' Bul. 328, pp. 5–22, figs. 10*).—The Biological Survey of this Department has made a study of the silver or silver-black fox raising and here furnishes information as to the possibilities of their propagation and the best methods of conducting the business. The history of silver fox breeding and the area suited for fox farming, with the character of location and space required, and equipment necessary, life history, and habits are considered.

"The number of persons now engaged in the business is relatively small, and the work is still experimental, yet many of the initial difficulties already have been overcome. Numerous minor failures seem explainable in large measure, and are offset by several conspicuous successes. It is therefore probable that under proper management fox raising will be developed into a profitable industry, and it is perhaps not too much to expect that a domestic breed of foxes will be produced. Only time can show how far such expectations will be realized, but present indications must be regarded as very encouraging."

A study of the food habits of birds. W. Leisewitz (*Verhandl. Ornithol. Gesell. Bayern, 7 (1906), pp. 265–275*).—A detailed account is presented of the nature of the food found in the stomachs of various species of hawks and owls including *Buteo buteo*, *Archibuteo lagopus*, *Astur palumbarius*, *Asio otus*, etc. These birds were found to feed upon hare, rabbits, pheasants, grouse, mice, marmots, moles, small birds, and to a less extent insects and frogs. On the whole it is believed that their feeding habits make these birds of some economic importance to the farmer.

Bird preservation. Spraying. H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1908), Nos. 10, pp. 299–328, pls. 4, figs. 8; 11, pp. 329–360*).—An account is given of the preparation and erection of nesting boxes and of the economic value and food habits of birds, together with a brief report of a study of the economic relations of birds during the year.

Popular notes are also given on the methods of preparing and applying various insecticides in the control of injurious insects.

Report of the entomologists. C. H. and H. T. Fernald and J. N. Summers (*Massachusetts Sta. Rpt. 1907, pp. 151–155*).—It is stated that the resistance of cucumbers when fumigated with hydrocyanic-acid gas has been determined. The leopard moth (*Zeuzera pyrina*) has appeared around Boston and the brown-tail moth has continued to spread over the State. The elm-leaf beetle is again becoming a serious pest. A "blight" of onions due to thrips caused a large loss in the Connecticut River Valley. A marked decrease was noted in the abundance of root maggots and cutworms, while the spruce gall louse, squash bug, and several kinds of caterpillars were unusually abundant.

Insects of 1907. R. H. Pettit (*Michigan Sta. Bul. 251, pp. 113–123, figs. 12*).—*Anaphothrips striatus* was the source of considerable injury to oats. This

was thought to be due to the unusually late spring which was followed by a hot, dry spell. Rains came in time to check the injury by killing many of the thrips and thus saved the greater part of the crop. A pentatomid (*Perillus claudus*) was frequently found piercing larvæ of the potato beetles and sucking them dry. Several farmers reported their work as so effective that it was not necessary to spray. The larvæ of the tussock moth was a source of considerable injury to apples shortly after the fruit had set.

The clover hay worm (*Pyralis costalis*) occasioned considerable loss as stock will not eat hay when badly webbed. It is recommended that the mows be cleaned out and that old hay be destroyed before the moths appear in early June.

The bean maggot (*Pegomyia fusciceps*) made its first appearance at the college in a field of beans. The rose chafer continued to injure grapes. In experiments made, best results were obtained from the application of arsenate of lead.

A small beetle (*Anomala binotata*) was found in one locality injuring young apple trees by feeding on the foliage. The strawberry crown girdler (*Otiorhynchus ovatus*) was reported for the first time as feeding on peach foliage.

Fifth annual report of the State entomologist of Montana, R. A. Cooley (*Montana Sta. Bul. 71, pp. 136–152, figs. 3*).—In this report the entomologist discusses the principal entomological features of the year. The army cutworm, which has been the source of great injury to crops in the spring, especially to wheat, has been given particular attention. This species has been determined as *Chorizagrotis auxiliaris*, the two forms *C. agrestis* and *C. introfercus* apparently being the same species. The life history and habits have been worked out and are described. The factors in natural control are also discussed. Considerable information was gained through a series of questions sent out to those whose fields were infested.

Other insects noted are the eye-spotted bud-moth (*Tmetocera ocellana*), oyster-shell bark-louse (*Lepidosaphes ulmi*), spotted blister beetle (*Epicauta maculata*), and the codling moth (*Cydia pomonella*).

Report on the injurious insects and other animals observed in the midland counties during 1907, W. E. Collinge (*Birmingham, 1908, pp. 60, figs. 13, map 1*).—The work of the year was largely concerned with a study of the habits, life history, and means of combating various insect pests and the preparation and application of insecticides. On the whole the season of 1907 was characterized by less extensive insect injuries to the crops and animals than that of 1906. It was found that the black-currant gall mite may be effectively controlled by the application of a mixture of lime and sulphur in either the dry or liquid form. A proprietary substance has been used in fumigating soil infested with various nematode worms and larvæ of insects which is said to give better results than carbon bisulphid or any other insecticide thus far tested.

The greater part of the report is taken up with specific accounts of injurious insects, including thrips, gall mites, bud mites, weevils, cockchafers, leopard moth, frit fly, carrot rust fly, woolly aphis, etc. The woolly aphis has been successfully controlled by application of contact insecticides to the soil about infested trees.

Papers on coccidæ or scale insects. New species of Diaspine scale insects, C. L. Marlatt (*U. S. Dept. Agr., Bur. Ent. Bul. 16, tech. ser., pt. 2, pp. 11–32, pls. 9*).—Seventeen species of scale insects mostly of economic importance are described as new to science. Ten species belong to the genus Aspidiotus, viz, *A. comperei*, *A. meyeri*, *A. cocotiphagus*, *A. africanus*, *A. coursetiæ*, *A. transcaspiensis*, *A. epigææ*, *A. mitchelli*, *A. popularum*, and *A. chenopodii*, and the

seven remaining are described as *Aonidia juniperi*, *Chionaspis micropori*, *Leucaspis indica*, *Mytilaspis chilopsidis*, *Parlatoria mangiferæ*, *P. pyri*, and *P. chinensis*.

Four species are apparently native to this continent while of the others five species have been found on living plants recently imported. *Leucaspis indica* and *Parlatoria mangiferæ* attack the mango, the former being established in mango plantings in Florida and Porto Rico, while the latter is found more or less generally infesting nursery stock in the Department greenhouses. A vigorous attempt is being made to exterminate both of these scales. Attention is called to the danger of accidentally introducing some of these foreign species.

Photomicrographs are given of the anal plates of the species described.

The scale insects of Argentina, E. Autran (*An. Soc. Rural Argentina, 42 (1908), No. 55, pp. 111–119, figs. 10*).—The distribution and injurious effects of scale insects of Argentina are briefly discussed. Particular mention is made of *Ceroplastes bergi*, *Margarodes vitium*, *Chionaspis citri*, and *Aulacaspis pentagona*.

Scale insects from Amani, L. Lindinger (*Pflanzer, 3 (1907), No. 23, pp. 353–360*).—Particular attention is given to an account of *Aspidiotus destructor* which causes serious injury to cocoanut palms. The author recommends that attempts be made to encourage the multiplication of the natural enemies of this insect. The use of emulsions was not attended with satisfactory results, since these insecticides caused injury to the plants. Notes are also given on *Chrysomphalus aurantii*, *Ceroplastes ceriferus*, and other species.

Remedies for the San José scale and directions for their use, P. J. Parrott (*New York State Sta. Circ. 9, pp. 12, figs. 2*).—Formulæ for sprays for San José scale and directions for their preparation and application are given. Brief notes are included on the thinning out and pruning of old apple orchards.

The Argentine ant in California, C. W. Woodworth (*California Sta. Circ. 38, pp. 11, figs. 2*).—This destructive ant has been found in the State for the first time. In several widely separated localities colonies appear to have become established. Attention is called to the injury by this insect in Louisiana to food supplies, stored products, field crops, fruit trees, etc. Remedial measures are described and methods of eradication suggested.

The mound-building prairie ant, T. J. Headlee and G. A. Dean (*Kansas Sta. Bul. 154, pp. 165–180, figs. 12*).—This ant (*Pogonomyrmex occidentalis*) is distributed throughout western Kansas and over a large part of the eastern plains of the United States.

"They live in large colonies in gravel-covered mounds, each located in a cleared circular space, and beneath these mounds in chambers and galleries that penetrate the earth as far as 10 ft. These chambers and galleries serve them as storerooms, nurseries, and workshops.

"While it is true they destroy a small percentage of cultivated crops, their substantial claim to the title of injurious insects lies in the annoyance caused the farmer in cultivating and harvesting his crops and in the discomfort resulting from their efforts to protect their habitations when occupying public streets, sidewalks, much-used paths, dooryards, and corrals.

"Large numbers of experiments have shown that thorough fumigation with carbon bisulphid is at once the easiest and most successful method of destroying them known at the present time."

The gipsy moth in Connecticut, W. E. Britton (*Ann. Rpt. Conn. Bd. Agr., 40 (1906), pp. 140–152, figs. 5*).—A historical statement is given of the introduction and distribution of the gipsy moth in this country. Particular attention is devoted in the present article to an account of the work thus far done in

attempting to eradicate the colony of gipsy moths which became established at Stonington, Conn.

Phylonactus abdeus, A. Schulz (*Rev. Secc. Agron. Univ. Montevideo, 1907, No. 2, pp. 132–138, pl. 1*).—This pest is closely related in biology and habits to the cockchafers and May beetles. The larvæ remain for a greater part of the time in the soil at a depth of 5 to 6 cm. In this position they cause considerable damage to wheat, barley, and other cultivated crops.

The insect pests of cardoon, P. Lesne (*Rev. Hort. [Paris], 80 (1908), No. 7, pp. 154–157, pl. 1*).—In the experience of the author the most important insect pests of the cardoon are crane flies, species of Gortyna, *Cassida deflorata*, etc.

The frit fly (*Bd. Agr. and Fisheries [London], Leaflet 202, pp. 4, fig. 1*).—The life history of this insect is briefly outlined. In controlling the pest it is recommended that oats be sown early, that heavy applications of fertilizers be made, and that badly infested fields be plowed under.

Spraying apple orchards for insects and fungi, B. S. Pickett (*Illinois Sta. Circ. 120, pp. 3–36, figs. 18*).—This circular is a compendium of information on spraying for insect and fungus enemies of the apple, as derived from experiments by various entomologists and the experience of practical orchardists as well as that of the author. Formulæ of standard spraying mixtures with directions for their application are given and the apparatus and methods of application are explained and illustrated. A spray calendar for the State is appended.

Demonstration spraying for bitter rot and codling moth, F. W. Faurot (*Missouri Fruit Sta. Bul. 15, pp. 3–17, pls. 10*).—Results of demonstration sprayings conducted in cooperation with the Bureau of Plant Industry of this Department are reported. Attention is called to the enormous percentage of the apple crop damaged by the apple scab and codling moth in the Ozarks.

An account is given of bitter rot, apple scab, and the codling moth. "To successfully control bitter rot, 4 applications of standard Bordeaux mixture made at intervals of 2 to 3 weeks, between the middle of June and the middle of August, are usually necessary."

"The time for treatment for codling moth coincides very well with the time of the treatments for scab and bitter rot and is made in connection with them. The first treatment is made with the second spraying for scab, just as the bloom has fallen; the second with the third for scab; the third should be on the trees by not later than the first of July and should be followed by about two others at intervals of 2 or 3 weeks. The last 3 applications are made with the sprayings for bitter rot."

Owing to the season being unfavorable to the development of scab, the results are omitted. Directions are given for the preparation of sprays, and spray machinery is discussed.

Suggestions for the control of the codling moth, J. J. Thornber (*Arizona Sta. Bul. 57, pp. 275–279*).—An account is given in concise form of the biology of this insect and the nature of its injury to fruit, with directions for combating it.

An olive pest, D. L. Navarro (*Prog. Agr. y Pecuario, 14 (1908), No. 563, pp. 22–24*).—The habits and life history of *Phlœothrips oleæ* are briefly discussed. This insect has recently caused serious damage to olives but may be controlled by spraying with contact insecticides.

Insects and diseases of the orange, M. T. Cook and W. T. Horne (*Estac. Cent. Agron. Cuba Bul. 9, pp. 40, pls. 19, figs. 2*).—This bulletin is in the nature of a preliminary report upon the important insects and diseases affecting the orange. The insect pests noted include *Atta insularis*, *Solenopsis geminata*, *Pachnæus litus*, orange dog, red spiders, rust mite, gall insects, plant lice, and

various species of scale insects. The authors also describe wither tip, scab, gummosis, seed-bed disease, blight, and other less important diseases.

Combating Tortrix ambiguella and Eudemis botrana, J. Dewitz (*Landw. Jahrb., 36 (1907), No. 5–6, pp. 959–996, pls. 2, figs. 14*).—Throughout a large portion of the grape-growing regions of Europe these two pests are serious enemies of grapes. No single remedy which has thus far been recommended is sufficient to control either of the insects. A combination of remedies must, therefore, be adopted according to the circumstances of each vineyard. In some vineyards *T. pilleriana* is also an important grape pest.

The remedies which have been tested by the author include the use of sticky shingles for catching the moths, lantern traps, destruction of the eggs with contact insecticides, the use of arsenical poisons for caterpillars, the destruction of pupæ with contact insecticides and with boiling water, removal of the loose bark from the trunks of grapevines, etc. Insecticide methods applied in winter are not so likely to give satisfactory results as similar work in summer.

Experiments in combating the grape-berry moth, J. Capus and Feytaud (*Rev. Vit., 29 (1908), Nos. 741, pp. 231–234; 742, pp. 257–259; 743, pp. 285–290*).—The author experimented with various solutions of arsenic, nicotine, and barium chlorid in controlling grape-berry moth. On the whole the arsenical preparations and barium chlorid gave better results than nicotine or other contact insecticides. Among the arsenicals preference is given to arsenate of lead, but barium chlorid, used in solutions of 2, 4, or 6 per cent, gave perhaps the most satisfactory results.

Zeuzera pyrina on cork oak in Algeria, P. Lesne (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 9, pp. 493–496*).—*Z. pyrina* is reported as causing great damage to cork oaks in certain parts of Algeria. The galleries produced by this insect in the trunks of the trees are of rather simple form and it appears possible to destroy the larvæ by injecting bisulphid of carbon into the burrows.

The Douglas spruce cone moth, R. A. Cooley (*Montana Sta. Bul. 70, pp. 125–130, pl. 1*).—The author's attention was first called to the work of the cone moth (*Cydia pseudotsugana*) in the spring of 1900, when thousands of the moths were observed flying about a Douglas spruce or red fir (*Pseudotsuga mucronata*). Observations have since been continued and studies of the life history which have been made are here reported.

This insect is so widespread in the portion of the State in which observations were made that it is very unusual to find an uninfected tree. It is estimated that under 5 per cent of the seeds escape injury. No other parts of the trees and only this species appear to be attacked. The eggs are deposited on the young cones during the last week of June. Upon emerging the larvæ enter the cone. Feeding is completed by the time the cone is fully hardened. The adult larva which is about ¾ in. in length resembles that of the codling moth in general appearance and motions. The winter is passed in the pupal stage, the greater number of moths emerging during the month of June.

Pebrine and related Microsporidia, A. Lutz and A. Splendore (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), No. 4, pp. 311–315, figs. 13*).—In a continued study of the genus Nosema, the authors found that a number of species of this genus live in various arthropods, worms, and fish. In addition to the species which causes pebrine in silkworms a description is given of a number of new species of this genus.

Fixation and multiplication of pathogenic trypanosomes in the proboscis of the tsetse fly, E. Roubaud (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 8, pp. 423–425*).—A study of the biological relations of trypanosomes in the proboscis of tsetse flies indicated that these parasites are able to fix themselves to the walls of the proboscis by means of their flagella and to multiply to a

considerable extent in this situation. This phenomenon was observed not only in the trypanosome of sleeping sickness but also in the trypanosomes of various animal diseases.

The use of arsenicals, L. Degrully (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 10, pp. 288–293*).—During the past few years many objections have been raised against the use of arsenicals on the ground that injurious effects might be produced in man and animals from eating plants treated with these insecticides. This idea has become so firmly rooted in the minds of some investigators that dealers have been prevailed upon to refuse to sell arsenical poisons. In the author's opinion the danger from arsenicals has been greatly exaggerated.

Attention is called to the satisfactory results obtained in spraying various plants with arsenicals for the destruction of leaf-eating caterpillars.

The choice of arsenicals for insecticide purposes, H. Grosjean (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 11, pp. 325–328*).—The insoluble arsenical salts are considered quite superior to those which are more readily soluble. In the opinion of the author these salts may be applied to nearly all kinds of vegetables and fruits in their early stages of growth without danger to the plants or to human beings who may consume the treated plants.

Fungicides, insecticides, and spray calendar, E. H. Favor (*Missouri Sta. Circ. Inform. 23, pp. 3–19, figs. 5*).—Directions for the preparation and application of fungicides and insecticides are given in this circular.

Spray calendar, A. F. Conradi (*Texas Sta. Circ. 10, folio*).—Formulæ of various insecticides and fungicides have been prepared for ready reference in the form of a calendar, together with general directions for their use.

Fumigation with hydrocyanic-acid gas (*Bd. Agr. and Fisheries [London], Leaflet 188, p. 3*).—In fumigating commercial stock it is recommended that one part of potassium cyanid and 1½ parts of sulphuric acid be taken for each 3¾ parts of water. The quantity of potassium cyanid per 100 cu. ft. of space to be fumigated may be varied somewhat, depending upon the nature and hardiness of the plants.

The queen of honey bees. A case of atavism, R. Demoll (*Biol. Centbl., 28 (1908), No. 8, pp. 271–278, figs. 2*).—A theoretical consideration of the different forms of individuals observed in a swarm of bees has convinced the author that there are only two original forms of individuals, the drone and the queen, while the workers are more highly specialized individuals based upon the original queen type. An examination of the anatomical structures of the queen as compared with those of the worker bee indicates quite clearly that the queen is the older type phylogenetically and that the worker is anatomically constructed on the same plan with a specialized development as the result of the division of labor in the colony.

Apiculture, L. Iches (*An. Soc. Rural Argentina, 42 (1908), No. 55, pp. 20–36, figs. 16*).—A general account is presented of the business aspects of apiculture with particular reference to the relationship of this industry to agriculture in general. A statement is given showing the expenses which would be incurred in establishing an apiary of the average size. A list is presented of the more important honey-producing plants.

Bee keeping in North Carolina, F. Sherman, Jr. (*Bul. N. C. Dept. Agr., 29 (1908), No. 1, pp. 27, figs. 5*).—Reports received from 360 bee keepers in the State, owning more than 10,400 colonies of bees, indicate that nearly all sections of the State are well adapted to bee keeping. Thus far bee keepers have given too little attention to the style of hive and to the breed of bees. It is recommended that black and hybrid bees be replaced by Italians, and the

old plank hives by modern ones. The three most important bee plants in the State are sourwood, tulip tree, and clover.

Bee keeping in Ontario (*Ontario Dept. Agr. Bul. 166, pp. 8*).—This report has been compiled from the answers to questions sent out in a circular to the bee keepers of the province. Of the answers received only 10 per cent reported that the industry was carried on at all extensively. Losses of the past 2 years were noted as having made a material change, few large apiaries being left, while many smaller ones were wiped out entirely. It is concluded that this will tend to keep up prices for the better quality of honey, and keepers are advised to give the work special attention.

"Very little disease was reported. While the percentage of dysentery seems high, in every case the correspondent stated that the attack was slight, generally occurring in only 1 or 2 hives in an apiary. Of the instances where foul brood was reported, in only 2 cases was the attack a severe one. European foul brood has appeared in the vicinity of Trenton in rather a virulent form, and has caused heavy losses in two apiaries."

As a result of work by 6 inspectors appointed in the spring a decrease in foul brood has been noted. A large territory in which little is known of the prevalence of this disease is to be inspected.

A large number of the reports received from apiarists having 100 or more colonies are given.

Bee diseases in Massachusetts, B. N. GATES (*Massachusetts Sta. Bul. 124, pp. 3–12, map 1*).—This is a reprint of Bulletin 75, part 3, of the Bureau of Entomology of this Department, previously noted (E. S. R., 20, p. 258).

A new method of controlling flaccidity of silkworms, P. GASPARINI (*Coltivatore, 54 (1908), No. 11, pp. 327–329*).—The best results thus far obtained in controlling flaccidity in silkworms have followed the use of a mixture of chlorin, formaldehyde, sulphur, corrosive sublimate, and phenol for fumigating infected apparatus.

FOODS—HUMAN NUTRITION.

The amount of extractive material in dark and light meat, M. ADLER (*Berlin. Klin. Wchnschr., 45 (1908), No. 8, pp. 393–396*).—Using analytical methods which he believes are more accurate, the author studied the amount and character of the nitrogen in red and white meat and discusses his results in comparison with those of earlier investigators. (See E. S. R., 13, p. 478.)

The following table summarizes the principal results:

Amount and character of nitrogen in meat and fish.

Kind of food.	Total nitrogen.	Extractive nitrogen.	Nitrogen of organic bases.	Kind of food.	Total nitrogen.	Extractive nitrogen.	Nitrogen of organic bases.
	P. ct.	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*
Beef, raw	3.52	0.4599	0.129	Chicken (leg), roasted	4.97	0.1100	0.034
Beef, roasted	3.60	.4290	.031	Ham, lean, lightly smoked, boiled	.....	.1500	.....
Beef, boiled	.....	.4200	.....	Ham, well smoked, raw	.....	.5100	.....
Veal, raw	3.44	.3700	.014	Carp, raw	3.24	.3120	.156
Veal, roasted	.....	.0630	.025	Carp, boiled	.....	.0690	.....
Veal, boiled	.....	.0570	.....	Cod, boiled	.....	.3200	.....
Pork, very lean, raw	3.87	.4500	.015				
Pork, very lean, boiled	.....	.0900	.....				

According to the author's results, beef and veal showed differences in the amount of extractive nitrogen present which justified the classification into

red and white meat. In the case of white meats, boiling removes more extractive nitrogen than roasting. The results obtained are discussed with special reference to invalid dietetics.

Commercial cuts of meat on the block (*Breeder's Gaz., 53 (1908), No. 11, pp. 599, 600, figs. 4*).—The system of cutting meat followed in the Chicago market is described and a large number of photographs of market cuts reproduced.

The native oysters of the west coast, R. E. C. Stearns (*Nat. Geogr. Mag., 19 (1908), No. 3, pp. 224–226*).—Statistical and other data regarding the oysters and oyster beds on the Pacific Coast of the United States.

Milling qualities of wheat, R. Stewart and J. E. Greaves (*Utah Sta. Bul. 103, pp. 243–276, figs. 2*).—Using 21 samples of Utah wheats grown under irrigated conditions and 70 samples grown under arid conditions, the milling qualities and character of locally grown wheats were studied, including both the common bread varieties and durum wheats.

The average weight of 100 kernels of the common bread variety tested was 3.0417 gm. and of 100 kernels of durum wheat 3.7258 gm. The wheats were ground in an experimental mill, the bread variety yielding on an average 53.21 per cent flour, 35.11 per cent bran, and 10.91 per cent shorts, and the durum varieties, 50.23 per cent flour, 31.97 per cent bran, and 17.27 per cent shorts.

The durum wheats on an average contained 8.89 per cent water and the bread varieties, 8.46 per cent. The average protein contents were respectively 18.82 per cent and 18.44 per cent, using the factor 6.25, or 17.14 per cent and 16.76 per cent, respectively, if the factor 5.7 is used. The water and protein content of the flour, bran, and shorts of the different kinds of wheat are reported. The proportion of wet gluten, dry gluten, the ratio of wet to dry gluten, the gliadin content, the glutenin content, the proportion of protein in the form of gliadin, the acidity, and the ash content of the different samples of flour were also studied.

According to the authors' summary, the Utah wheats are characterized by a low water content and a protein content much above the average. The percentage of protein in wheat grown on irrigated lands was lower than that of wheat grown on arid farms. The Gold Coin wheat showed the lowest protein content of any variety studied.

"The theory that the heavier weight per 100 kernels the greater the yield of flour obtained does not receive any support from our work. The statement that spring varieties of wheat have a higher percentage of protein is confirmed by our results.

"The protein content of the common bread varieties is nearly equal to that of the durum varieties, the difference being only 0.5 per cent. The durum wheats are heavier, kernel for kernel, than the bread varieties.

"There are noticeable variations in the yield, milling, and chemical characteristics of the same varieties of wheat grown on the various arid farms of the State. The moist and dry gluten content of Utah wheats is very high. The bran and shorts produced from the common bread varieties of wheat are fully as nutritious as the bran and shorts produced from the hard varieties of wheat.

"If the gluten content determines the value of durum wheats for the making of macaroni, the common bread varieties grown in Utah should be just as valuable for this purpose.

"The gliadin content of durum wheats is slightly higher than that of the soft varieties.

"No single variety now possesses, combined, the desired characteristics of yield, protein content, flour yield, weight per bushel, and the most desirable milling qualities. However, sufficient evidence is presented to indicate those varie-

ties which it will be most profitable to use for selection in order to obtain the desired results."

The baking quality and the bleaching of flour, J. F. HOFFMANN (*Wchnschr. Brau., 25 (1908), No. 7, pp. 108–110, fig. 1*).—According to the author's conclusions, the physiological condition of the proteids, which influences in large measure the germinating power and bread-making quality of grain, is dependent upon the weather conditions under which the grain ripens. The baking quality can be improved either by drying the grain or by the addition of malt flour. Bleaching with chemical reagents, the author considers, does not permanently improve baking quality.

Bread used by peasants, E. GRÜNER (*Agr. Mod., 14 (1908), No. 6, pp. 71, 72*).—Data are given regarding a bread made of corn meal and wheat, which the author considers more satisfactory than the corn bread which is so commonly eaten in many regions in Italy.

Breakfast foods, W. FREAR (*Penn. Dept. Agr. Bul. 162, pp. 40*).—The general characteristics and chemical composition were determined of a number of samples of cereal breakfast foods and pancake flours on sale in Pennsylvania.

The results obtained "show clearly that the materials used in preparing the cereal breakfast foods are wholesome grains or some of their more valuable products, and that the addition of bran, corncob, cornstalk, etc., sometimes said to be used as adulterants, is purely imaginary. Furthermore, the samples exhibited a good condition of dryness, but many were wormy when received. In general, they exhibited no evidence of the use of bleaching agents, except in the case of a few pancake flours.

"The test for tonic materials, such as strychnin, and also for morphin, were negative. On the other hand, the net weights contained in the packages were most variable. The representations concerning the chemical composition and nutritive value of the preparations were often very highly misleading, and sometimes utterly reckless.

"The cost of these foods was low if they are regarded as confections to please the taste, but very high if they be treated as substitutes for the ordinary domestic cereal products."

Examination of a new preparation, "ice cream powder," F. FERRARI-LELLI (*Arch. Farmacol. Sper. e Sci. Aff., 7 (1908), No. 1, pp. 1–4*).—The ice cream powder examined, according to the author, contained oat and wheat starch and Mars yellow.

The proteins of rice, O. ROSENHEIM and S. KAJIURA (*Jour. Physiol., 36 (1908), No. 6, pp. LIV, LV*).—In a preliminary communication the authors report studies of proteins of rice, the work being undertaken to determine whether the presence or absence of certain proteins or their cleavage products might possibly have any relation to the apparent fact that a diet mainly of rice is a predisposing factor in the causation of beriberi. Rice globulin, rice albumin, and a protein for which the name "oryzenin" is proposed were the bodies identified, the last-named representing the bulk of the rice proteins. It is insoluble in water, salt solutions, and dilute alcohol, but is soluble in dilute alkali (0.2 per cent potassium hydroxid) and is isolated by means of this solvent. When dried it is in the form of a white powder and gives all the usual protein color reactions.

"The absence of any protein soluble in alcohol is a characteristic feature of rice. . . . This fact obviously explains the unsuitability of rice for bread making, for both an alcohol-soluble protein (gliadin) and an alcohol-insoluble protein (glutenin) appear to be necessary for the formation of gluten, the essential constituent of dough. All our attempts to obtain gluten from rice have up to the present been unsuccessful.

It is said that the addition of barley to a rice diet prevents the occurrence of beriberi. This cereal and some others contain gliadins and are characterized by high percentages of glutaminic acid among their cleavage products. The authors propose to study the questions suggested by these facts with reference to beriberi.

Comparison of potatoes and rice, Louise Shipman (*Ill. Agr., 12 (1908), No. 5, pp. 149, 150, fig. 1*).—Data are summarized regarding the nutrients, energy value, and cost of equivalent amounts of raw and cooked potatoes and rice. According to the author, rice takes up about 5 times its weight of water when cooked.

The uses and composition of tamarind seeds, D. Hooper (*Agr. Ledger, 1907, No. 2 (Veg. Prod. Ser., No. 101), pp. 13–16, fig. 1*).—Tamarind seeds, it is stated, are universally eaten by the poorer people of India during times of scarcity and famine and are occasionally eaten at other times. Seeds with and without the outer hull were analyzed and a study of the fat of tamarind seeds was also made. The amount of fat present is small. The principal constituents are protein and carbohydrates, the proportions present in the kernel without the brown covering being 18.06 and 62.88 per cent, respectively.

"There is a decided difference in the composition of the shelled and unshelled seeds. The shells contain the undesirable constituents, namely, the tannin matter and fiber, and the kernels represent a nutritious food, white in appearance and with no disagreeable odor and taste."

The staff tree (Celastrus scandens) as a former food supply of starving Indians, F. T. Dillingham (*Amer. Nat., 41 (1907), pp. 391–393; abs. in Chem. Abs., 2 (1908), No. 5, p. 674*).—The food value of this product is attributed to the presence of mannan.

Strained honey, A. McGill (*Lab. Inland Rev. Dept. [Canada], Bul. 145, pp. 29*).—Of 253 samples of so-called strained honey collected throughout the Dominion of Canada, 219 samples were genuine, 31 of them showing a high water content. Of the remaining samples 4 were doubtful, 16 apparently adulterated, and 14 sold as compound.

According to the author, "the highest amount of water found in any of these samples is 31.4 per cent. . . . The ash of honey is due almost entirely to the accidental occurrence of dust, which sticks to the nectar, or other saccharin fluid, gathered by the bees. It is usually a mere trace, but exceptional instances are on record when it has reached 0.3 per cent."

In the author's opinion, a high ash content in honey is due to carelessness in handling with consequent access of dust, and he does not believe that the ash content is valuable for detecting adulterated honey.

Various other questions connected with honey and honey adulteration are briefly considered.

Sophistication of honey, J. Zimmermann (*Honigfälschungen und Honigfälscher [1908], pp. 80; rev. in Chem. Ztg., 32 (1908), No. 14, p. 165*).—A discussion of the importance of pure food laws with reference to the honey industry and related topics.

New preserved fruit products, J. Halmi (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 277–280*).—Hungarian products are described, including so-called plum bread, plum jelly, plum flour, and similar products made from apricots and apples.

The composition of fresh avocado fruit, E. A. Patrault (*Bul. Assoc. Chim. Sucr. et Distill., 25 (1908), No. 8, pp. 777, 778*).—According to the analytical data presented, the edible portion of the avocado has the following percentage composition: Water 82.1, protein 1.2, fat 8.7, sugar 2.9, cellulose and undetermined material 4.6, and ash 0.5 per cent. Starch and tannin were not present.

The fat, it is stated, is a green aromatic oil with an odor recalling that of laurel oil, which solidifies at 15° C. The sugar present was not completely identified. It reduced Fehling's solution, and hence is not the same as that which has been identified in the avocado seed.

Dried bananas from Queensland (*Epicure, 15 (1908), No. 171, p. 94*).—Brief statistical and other data regarding the manufacture and use of dried bananas and banana flour.

Hydrolytic and catalytic enzyms in relation to the ripening of fruit, G. TALLARICO (*Arch. Farmacol. Sper. e Sci. Aff., 7 (1908), Nos. 1, pp. 27–48; 2, pp. 49–68*).—In the experiments reported the different sorts of ferment activity were measured with bananas of varying degrees of ripeness ranging from unripe to overripe.

Vitis opaca and chemical investigation of its enlarged rootstock, R. T. BAKER and H. G. SMITH (*Jour. Proc. Roy. Soc. N. S. Wales, 40 (1906), p. 52; abs. in Chem. Abs., 2 (1908), No. 5, p. 674*).—The data reported include the chemical composition and a discussion of the use as food by the aborigines of tubers produced on the roots of this native Australian grape.

Examination of an oil-yielding fruit "Njore-Njole" from Kamerun, BRIEGER and M. KRAUSE (*Tropenpflanzer, 12 (1908), No. 2, pp. 83, 84, fig. 1*).—A study of Njore-Njole oil and report of determinations of its physical constants in comparison with olive oil and peanut oil. The authors believe that it has a decided agricultural value. The fruit and seed from which the oil is obtained are described.

Concerning the oil content of different olive samples, N. PASSERINI (*Bol. Ist. Agr. Scandicci, 2. ser., 7 (1908), No. 1, pp. 1–11*).—The analytical data reported are discussed on the basis of different methods of obtaining olive oil.

Examination of fruit juices, E. SUNDE (*Tidskr. Kemi Farm. og Ter., 1907, No. 13, pp. 202–204; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 6, p. 363*).—Of 35 samples of Norwegian commercial fruit juices only 12 were found to be unadulterated.

Concerning barberry juice, F. SCHULZE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 289, 290*).—Three samples of barberry juice were analyzed.

Concerning orange juice, W. STÜBER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 273–276*).—Samples of fermented and unfermented orange juice prepared by the author were analyzed, together with commerical goods.

Studies of the organic phosphorus compounds in wine, A. FUNARO and A. RASTELLI (*Ann. R. Accad. Agr. Torino, 49 (1906), pp. 33–57*).—The proportion of phosphoric acid in organic and in inorganic combination in a number of samples of wine is reported and the general question of phosphorus compounds in wine is discussed.

Composition of wine from Urbino, A. AGRESTINI (*Staz. Sper. Agr. Ital., 41 (1908), No. 1, pp. 35–50*).—Data are reported and discussed regarding the composition of 25 samples of wine.

Bilberry wine, W. DONSELT (*Pure Products, 4 (1908), No. 3, pp. 126–129*).—The manufacture of bilberry wine, a material which was formerly considerably used for blending claret, is described.

Kafir beer, A. C. CHAPMAN and F. G. S. BAKER (*Jour. Inst. Brew., 13 (1907), No. 7, pp. 638–645*).—Anaylses of 2 sorts of Kafir beer are reported and these beers and other similar beverages are discussed with reference to lactic-acid content and other characteristics.

The manufacture of cocoa with definite fat content, R. BÖHME (*Chem. Ztg., 32 (1908), Nos. 9, pp. 97–99; 10, pp. 110–112*).—The problem of manufac-

turing cocoa of definite fat content which will correspond with the requirements of the pure-food law is discussed and analytical data summarized.

The aroma of black tea, T. KATAYAMA (*Bul. Imp. Cent. Agr. Expt. Sta. Japan, 1 (1907), No. 2, pp. 149–152; abs. in Chem. Ztg., 32 (1908), No. 21, Report., p. 135*).—According to the author's observations, the aroma is due to an enzym acting upon a glucosid present in the tea. The experimental work is not yet concluded.

Gulasch extract, F. SCHULZE (*Ztschr. Untersuch Nahr. u. Genussmtl., 15 (1908), No. 5, pp. 287, 288*).—A commercial Gulasch extract is described and data regarding its composition reported. Apparently this material consisted of onion, paprika, and animal fat.

Economical preservation of food, LEONA B. GARRETT (*Ill. Agr., 12, 1908*), *No. 5, pp. 139–141*).—In a comparison of the cost of home-canned fruit and vegetables with commercial products of the same grade, it was found that in every case the homemade product was cheaper as well as of superior quality.

Preserving wild mushrooms, E. F. PERNOT (*Oregon Sta. Bul. 98, pp. 3–6.*—According to the author mushrooms may be readily canned in their own liquor in either tin or glass by household methods, the young mushrooms being best for the purpose. Sterilizing the cans at intervals for several days is recommended. The author also states that mushrooms may be readily canned if cooked in milk or in any other way which is preferred.

When older mushrooms are used for canning they reduce very much in quality, turning black and becoming mushy. The flavor is not injured, though the appearance is not so attractive as that of young mushrooms. The author therefore recommends that the older mushrooms be dried and powdered. "Mushroom powder keeps very well and it is one of the most delicious flavoring condiments of the kitchen. The powder should at once be placed into well-stoppered dry bottles or fruit jars well sealed and kept in a warm, dry place. Mushrooms that are wet can not be successfully dried. The best are those which grow and are gathered dry."

Directions are also given for making mushroom catsup.

Different methods of preserving meat, P. RAZOUS and R. NOURISSÉ (*Les divers procédés de conservation des viandes. Paris, 1907, pp. II+79, figs. 11*).—This volume contains chapters on preservation of meat by antiseptics, cooking and sterilization, low temperature, and desiccation, and a special chapter on the preparation and preservation of pork products.

The fireless cooker, WITT (*Österr. Molk. Ztg., 15 (1908), No. 5, pp. 60–63, figs. 11*).—So-called fireless cookers of different sorts are described and this method of cooking briefly discussed.

General results of the investigations showing the effect of benzoic acid and benzoates upon digestion and health, H. W. WILEY (*U. S. Dept. Agr., Bur. Chem. Circ. 39, pp. 15, figs. 2*).—Using healthy young men as subjects the effects of benzoic acid and benzoate of soda were studied to secure data which would be of use in judging these materials as food preservatives. Variations in body weight, the composition and character of the excretory products, the balance of income and outgo of sulphur, nitrogen, and phosphoric acid, the characteristics of the blood and urine as shown by the microscope and similar data were recorded.

Quotations from the general conclusions follow:

"From a careful study of the data in the individual cases and of the summaries of the results, it is evident that the administration of benzoic acid, either as such or in the form of benzoate of soda, is highly objectionable and produces a very serious disturbance of the metabolic functions, attended with injury to digestion and health.

"As in the case of boric acid, salicylic acid, and sulphurous acid, this injury manifests itself in a number of different ways, both in the production of unfavorable symptoms and in the disturbance of metabolism. These injurious effects are evident in the medical and clinical data, which show grave disturbances of digestion, attended by phenomena which are clearly indicative of irritation, nausea, headache, and, in a few cases, vomiting. These symptoms were not only well marked, but they were produced upon healthy individuals, receiving good and nourishing food and living under proper sanitary conditions. It is only fair to conclude, therefore, that under similar conditions of administration of benzoic acid or benzoate of soda in the case of weaker systems, or less resistant conditions of health, much more serious and lasting injury would be produced.

"It was also noticed that the administration of benzoic acid and benzoate of soda was attended with a distinct loss of weight, indicative of either a disturbance of assimilation or an increased activity in those processes of the body which result in destruction of tissue. The production of a loss of weight in this kind must be regarded as indicative of injurious effects.

"The influence of the benzoic acid and benzoate of soda upon metabolism was never of a character indicative of a favorable change therein. While often the metabolic changes were not strongly marked, such changes as were established were of an injurious nature. It is evident that the administration of these bodies, therefore, in the food tends to derange metabolism in an injurious way.

"An important fact in connection with the administration of these bodies is found in the efforts which nature makes to eliminate them from the system. In so far as possible the benzoic acid is converted into hippuric acid. There is a tendency usually manifested, however, to retain the benzoic acid in the body for a notable length of time, and this is much more marked in the case of benzoate of soda than in the case of benzoic acid.

"While the administration of both these bodies, therefore, is undoubtedly harmful, the injurious effects are produced more rapidly in the case of benzoic acid than they are in the case of benzoate of soda; the data, however, will show that the total harmful effect produced in the end is practically the same in both cases; hence there appears to be no reason for supposing that the administration of the preservative in the form of benzoate of soda can be justified by any argument relating to the less injurious effect thereof upon health.

"The occurrence of microscopic bodies in the urine is undoubtedly increased under the administration of benzoic acid in both forms, thus showing conclusively the tendency to stimulate the destructive activities of the body.

"Coming to the final consideration of all of these different phases of the subject, there is only one conclusion to be drawn from the data which have been presented, and that is that in the interests of health both benzoic acid and benzoate of soda should be excluded from food products."

Preservatives in food and the effect thereof on the public health, H. W. WILEY (*Amer. Jour. Pub. Hyg., 18 (1908), No. 1, pp. 27–30*).—Information collected from some 250 physiologists, hygienists, health officers, and physicians showed that the majority were not in favor of the use of preservatives other than the usual condimental preservatives sugar, salt, alcohol, vinegar, spices, and wood smoke, and believe that other preservatives as a class are injurious to health and not essential. The metabolism and excretion of chemical preservatives and other similar topics are briefly discussed.

[Food and dairy laws] (*Penn. Dept. Agr. Bul. 160, pp. 69*).—The law creating the State department of agriculture, the legislative acts pertaining to the

dairy and food division, and a digest of numerous court cases relating to these laws are included in this bulletin.

Food of a large city. Sources and average food supply of Paris, É. PAYEN (*Rev. Écon. Internat., 5 (1908), I, No. 2, pp. 370–391*).—A summary of statistical and other data regarding the food supply of Paris.

Food and fare in Italy, LUCY M. YATES (*Epicure, 15 (1908), No. 171, pp. 72, 73*).—Typical foods, methods of cooking, and character of the meals served in Italian families, and similar questions are discussed.

Diet and hygiene in Korea, J. H. WELLS (*Dietet. and Hyg. Gaz., 24 (1908), No. 3, pp. 154, 155*).—On the basis of personal experience the author discusses diet and hygiene in Korea with special reference to disease.

The composition and energy value of the food of the soldier, M. S. PEMBREY and L. E. L. PARKER (*Jour. Physiol., 36 (1908), No. 6, pp. XLIX, L*).—The reported data show the calculated nutrients and energy supplied per man per day by the peace ration and messing allowance of 4 regiments of the British army. The average protein ranged from 123 to 142 gm. per man per day and the energy from 3,248 to 3,478 calories. Soldiers purchase some food in addition to the ration supplied. This is not taken into account in the above estimates.

According to the authors, there is little doubt "that the minimum diet of the soldier is above 100 gm. of protein, 100 gm. of fat, and 400 gm. of carbohydrate and possesses an energy value above 3,000 calories."

Some figures [regarding the nutritive value and cost of food served in a student boarding club], AGNES HUNT (*Ill. Agr., 12 (1908), No. 5, pp. 146–148*).—It is stated that a successful attempt was made to furnish a satisfactory diet to a club averaging 26 faculty and student members at a cost of 50 cts. per person per day, which sum included the cost of raw materials, cooking, and serving. The diet was fairly varied. Meat or eggs were served each day at 2 meals only. A liberal use was made of milk, chiefly as an addition to cereal foods and puddings and in the preparation of various dishes. Potatoes and cereals were also supplied in abundance.

It was found that 53.3 per cent of the total food expenditure went for animal foods and 46.7 per cent for vegetable foods. Meat was the most expensive item, 16.5 per cent of the total being expended for meat exclusive of chicken. The sum expended for chicken and eggs was 12.6 per cent, for butter 11 per cent, and for bakers' goods 9 per cent of the total.

A day's ration with student valuations, NELLE M. DICKINSON (*Ill. Agr., 12 (1908), No. 5, pp. 142–145*).—The data reported include menus and food values, prepared with a view to meeting the requirements of dietary standards and not to exceed a definite amount as regards cost.

The provision of meals for school children, R. H. CROWLEY (*Pub. Health [London], 20 (1908), No. 5, pp. 325–335, chart 1*).—The plan tried experimentally in Bradford, England, of furnishing breakfast and dinner to children in the poor quarters of the city is outlined. The meals supplied are described and some of the principal results secured are reported. The meals were inexpensive, costing a little over 2.5 cts. per child per day, or including administrative expenses about 4 cts. per day. Gains in weight and improvement in condition of the children were observed. The experiment was so planned that it might have educational value.

The author believes that, provided the scientific and educational aspects of such public feeding of school children are taken into account, very great benefits to the children will undoubtedly follow the adoption of such a plan.

Lessons in practical hygiene for use in schools, ALICE RAVENHILL (*London [1907], pp. 744; rev. in Pub. Health [London], 20 (1908), No. 4, pp. 274,*

275).—This volume deals with various branches of general and special hygiene and gives a series of illustrative experiments for each branch taken up. Food constituents, action of cooking on food, beverages, and tests for the quality of food stuffs are among the subjects included.

The elements of the chemical physiology of digestion, S. Schmidt-Nielsen (*Elementerna af Matsmaltningens Komisha Fysiologi Upsala, 1907, pp. 13*).—A syllabus of lectures delivered at the summer course at Upsala University, 1907.

Progress in proteid chemistry with special reference to biological problems, E. Abderhalden (*Naturw. Wchnschr., 23 (1908), No. 8, pp. 113–121, fig. 1*).—A summary of results of recent investigations in proteid chemistry with special reference to the structure of the proteid molecule, the synthesis of proteids from amino acids, the food value of different proteids as dependent upon their structure, the importance of ferments in body processes, and related questions.

Protein synthesis in the animal body, V. Henriques (*Ztschr. Physiol. Chem., 54 (1908), No. 5–6, pp. 406–422*).—The experiments reported, the author believes, show that with albumin cleavage products as the sole source of nitrogen it is possible not only to maintain body weight but also to make substantial gains in nitrogen. Cleavage products obtained by the action of trypsin and erepsin retain this property even if heated on a water bath for 6 hours with 20 per cent sulphuric acid at a temperature of boiling water. When heated for 17 hours, the products no longer suffice to maintain nitrogen equilibrium. Apparently this had some connection with the ability to give the tryptophan reaction, as this was plainly noticeable with the cleavage products with which nitrogen equilibrium could be maintained and was absent when nitrogen equilibrium was not possible. The experiments reported were made with small animals.

Experiments on the influence of an excess of fat in the diet on the digestive tract and on metabolism, E. Biernacki (*Reprinted from Poln. Arch. Biol. u. Med. Wiss., 3 (1907), pp. 272–313; Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 2 (1907), No. 11, pp. 401–414*).—The chief effect noted from an excess of fat in the diet was a lowering of the oxidation of protein, which was manifested as a decrease in the amount of urea excreted and an increase in the urine constituents called amido acids. An excess of sugar also caused a lowering of the urea coefficient but starch did not have this effect. The experiments reported were made with dogs.

Cotton-seed oil taken in food and injected, K. Lendrich (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 6, pp. 326–334*).—In experiments with rabbits it was found that only a limited amount of cotton-seed oil constituents appeared in the body fat though the feeding was continued for a long time. When the cotton-seed oil was injected into the digestive tract phytosterin was rapidly resorbed but not the other constituents.

Carbohydrate metabolism, H. McGuigan (*Science, n. ser., 27 (1908), No. 689, pp. 429, 430*).—The author studied carbohydrate metabolism by means of perfusion experiments with surviving tissue. According to his results, both dextrose and levulose are directly attacked by living tissues and the amount diminished. "If there be a conversion of either into glycogen it takes place in the muscle as it is oxidized, which is highly improbable.

"Maltose is not used directly by the muscle. There is some loss of sugar, but if we assume that the dextrose in the blood is utilized in preference to maltose, no reduction of the quantity of maltose takes place. If we grant that both are used equally there could be at most only a slight reduction of the maltose. . . .

"Investigation of the other sugars has not been concluded."

Sugar in the ration during military maneuvers, Joly (*Arch. Méd. et Pharm. Mil., 49 (1907), p. 241; abs. in Hyg. Zentbl., 3 (1908), No. 21, pp. 674, 675*).—For 3 weeks 60 to 165 gm. of sugar replaced half of the meat ration of 2 companies of French soldiers. The sugar was taken readily in wine, water, or coffee and no digestive disturbances were noted. Five soldiers for 3 days took a larger amount of sugar, namely, 300 gm., in the place of the entire meat ration. In the author's opinion, the men were in better physical condition and had more endurance than on their ordinary ration.

Cleavage in metabolism, Pütter (*Med. Naturw. Arch., vol. 1, No. 1, p. 61; abs. in Zentbl. Physiol., 21 (1908), No. 24, pp. 815, 816*).—According to the author's deductions, the oxidation processes play a smaller part and anærobic cleavage processes a much greater part in metabolism in the animal body than is ordinarily supposed.

Concerning the extractives of muscular tissue. IX, The constitution of carnitin, R. Krimberg (*Ztschr. Physiol. Chem., 53 (1907), No. 6, pp. 514–525*).—According to the author, carnitin is a γ-trimethyl-oxy-butyro-betain.

For earlier work see a previous note (E. S. R., 18, p. 960).

Creatin and creatinin, E. Mellanby (*Jour. Physiol., 36 (1908), No. 6, pp. 447–487, figs. 3*).—Methods of estimation, the stability of creatin in muscles, the effect of glycocyamin feeding on the creatin in chickens' muscle, the effects of creatin and creatinin on the percentage of creatin in muscles, and other questions were considered in connection with the investigations reported.

According to the author's conclusions, the muscle plays a small part in the formation of creatinin, while the liver is intimately connected with the production of creatin and the excretion of creatinin. He believes that muscle creatin is formed from creatinin, the principal reasons for this opinion being that "the feeding experiments on young chickens yield some slight evidence that food creatinin can be changed to creatin and stored. In no physiological experiment in this research has creatin ever been changed to creatinin. Creatinin is not excreted by chickens until about a week after hatching, i. e., not until the muscles are saturated with creatin. . . .

"The change from creatinin to creatin is from every point of view more likely than the change from creatin to creatinin. From a chemical consideration it is more probable that the ring formation of creatinin comes direct from a tissue breakdown, and that this ring is then hydrated to a creatin chain by muscle, rather than that the creatin chain is dehydrated to form the creatinin ring.

"From a physiological point of view it can not be thought that tissues would make an innocuous neutral substance like creatin into a strongly basic substance like creatinin. Such a change would be contrary to all that is known of the changes undergone by chemical substances in the organism."

Studies of the cholesterin group, A. Menozzi (*Atti. R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), I, No. 3, pp. 91–94*).—Chemical studies of cholesterin from hens' eggs led to the conclusion that it is identical with the cholesterin of bile.

Body temperature and periodicity, W. A. Osborne (*Jour. Physiol., 36 (1908), No. 6, pp. XXXIX–XLI*).—The body temperature records kept on a journey from Melbourne to London, which the author presents, tend to prove, in his opinion, that the time of evening maximum takes place with regard to local time and not the time of the starting point. "They do not, however, disprove the existence of body periodicity nor prove that the evening maximum is determined solely by the hours of sleep, the activities of the day and the diurnal variations of light and heat, for a true periodicity might have been present

but adjusted to the new conditions owing to the very gradual manner these were introduced."

Work under pressure and in great heat. J. S. HALDANE (*Sci. Prog. Twentieth Cent., 2 (1908), No. 7, pp. 378–398, figs. 4*).—The author summarizes and discusses the results of his own investigations and other data regarding atmospheric moisture, heat, atmospheric pressure, and other conditions with special reference to their effect on muscular work.

ANIMAL PRODUCTION.

Inspection of feeding stuffs (*New York State Sta. Bul. 303, pp. 203–254*).—Of 297 samples of cotton-seed meal, linseed meal, gluten feed, corn bran, dried distillers' grains, malt sprouts, dried brewers' grains, hominy feed, barley and oat by-products, beet-sugar wastes, meat meals and other animal products, poultry foods, and other feeding stuffs analyzed, 28 were materially below guaranty, which is 41 less than the number found a year ago. Tables of analyses are given.

"With reference to the proprietary feeds, not only have the percentages of protein, fat, and fiber been determined, but these mixtures have been studied with reference to the ingredients from which they were compounded. This was done by a microscopic examination of 38 brands.

"Nearly all of these compounded feeds contain either oat hulls greatly in excess of what belong to the ground oats present, or ground corncobs.

"The molasses feeds . . . nearly all contained a great variety of weed seeds, some of which are noxious weeds such as mustard, charlock, wild carrot, and English plantain (narrow-leaved plantain, buckhorn). Germination tests show that in several cases these seeds have not lost the power of germination."

It is stated that these weed seeds have an unknown nutritive value and that many pass through the animals undigested, thus becoming a menace not only to the land but also to the productiveness of the animals which receive a smaller quantity of digestible nutrients than has been assumed by the feeder who buys these feeding stuffs for pure sound grains.

Twelve gluten feeds examined for acids and artificial coloring matter were found to have a total acidity equivalent to from 0.09 to 0.91 per cent hydrochloric acid. Sulphuric acid was present only in traces, except in one sample which showed 0.18 per cent of SO_3. The acidity was much higher in the 7 samples found artificially colored and it is suggested that the acids may be added to fix the coloring matter.

Feed stuffs, R. E. ROSE (*Fla. Quart. Bul. Dept. Agr., 18 (1908), No. 1, pp. 17–21, 36–39, 96–121*).—According to the results of 223 analyses, "the general average of all the commercial feed sold in the State was slightly above the guaranty." The valuation of feeding stuffs and related questions are spoken of.

The materials examined included bran, middlings, shorts, mill feed, ship stuff, ground ear corn, hominy feed, cotton-seed meal, cotton-seed hulls, gluten feed, cocoanut meal, commercial or proprietary feeds, sugar or molasses feeds, beet pulp, commercial poultry feeds, Natal grass hay, and Japanese Kudzoo vine hay.

The composition of Natal grass hay was as follows: Protein 7.45, fat 1.80, nitrogen-free extract 39.23, crude fiber 36.75, and ash 5.02 per cent, and of Japanese Kudzoo vine hay—protein 16.59, fat 1.68, nitrogen-free extract 32.81, crude fiber 40.09, and ash 8.83 per cent.

Execution of the [Massachusetts] feed law, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1907, pp. 90, 91*).—The chief result of inspection was the discovery

of numerous lots of inferior cotton-seed meal due in part to heavy rainfalls in the autumn of 1906, when large quantities of cotton seed were damaged. One new feed was found, known as flax feed, and consisting substantially of one-third imperfectly developed flax seed and two-thirds of a variety of ground weed seeds. It has an extremely bitter taste and cows ate it rather grudgingly when fed by itself, though consuming it readily when mixed with other grains.

German meadows and the estimation of the value of meadow hay, A. NAUMANN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 4 (1908), No. 1–2, pp. 50–101, pls. 2, figs. 9*).—A discussion of typical meadow lands and other grass areas found in different countries, a classification of the meadow areas of Germany, and a summary of classified data regarding the botanical distribution, chemical composition, and other characteristics of grasses and other plants found on such areas. Micro-organisms which occur on meadow plants and hay are described and illustrated and the question of poisonous plants found in meadows is also taken up.

The composition and digestibility of hay from sewage meadows (*Agr. Mod., 14 (1908), No. 14, pp. 184, 185*).—Analytical and other data are summarized and discussed.

The native fodder plants of New South Wales, J. H. MAIDEN (*Off. Yearbook N. S. Wales, 1905–6, pp. 754–759*).—A description of grasses, saltbushes, and other fodder plants native to New South Wales with some notes on their use and palatability.

Ensiled beet pulp and its by-products, J. GIELE (*Jour. Soc. Cent. Agr. Belg., 55 (1908), No. 4, pp. 110–112*).—Analytical and other data regarding the composition of ensiled beet pulp are reported and discussed.

Buckwheat feed, F. W. WOLL (*Hoard's Dairyman, 39 (1908), No. 10, p. 300*).—This discussion of buckwheat feeds of different kinds quotes analyses made at the Wisconsin Experiment Station.

Experiments on the nutritive value of nonproteid nitrogenous constituents of hay, O. KELLNER (*Jour. Landw., 56 (1908), No. 1, pp. 49–52*).—A critical discussion.

The value of glutaminic acid and aspartic acid as nutrients, K. ANDRLÍK and K. VELICH (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 6, pp. 313–342*).—In the experiments with sheep which are reported 96 to 98 per cent of both glutaminic acid and aspartic acid, taken as sodium salts, were resorbed. The urine did not contain any appreciable quantity of these acids, nor of simpler amino acids. Both acids were retained in the body, the proportion of aspartic acid thus retained being the greater. The resorbed material was in part used for the formation of protein and in part as a source of energy. When glutaminic acid was taken only 43 per cent of the food protein was resorbed as compared with 54 per cent in the case of the aspartic acid ration and 49 per cent with the normal ration.

Fat formation from protein and methods of estimating fat, E. A. BOGDANOW (*Jour. Landw., 56 (1908), No. 1, pp. 53–87*).—According to the author's experience, it is possible to find pigs, though the proportion is small, capable of taking large quantities of protein without disturbing general good health, and with such animals the utilization of casein and meat meal containing little fat was studied.

It was found that a ration very rich in protein induced only small gains in fat even when the feed was eaten in quantity with a good appetite. The author considers it probable, however, that fat was formed from protein under such conditions though the quantity was not large. He calls attention to the fact that this is in accord with the view that at least certain proteins contain pre-

formed carbohydrates and that glycogen formation from protein has been noted by other observers. His method of fat estimation depends upon double extraction and subsequent determination of the fatty acids, a method which, in his opinion, gives particularly satisfactory results in studies of fat formation in the body.

Studies of the digestibility of dried potatoes, O. KELLNER ET AL. (*Landw. Vers. Stat., 68 (1908), No. 1–2, pp. 39–60*).—In experiments with pigs the average coefficients of digestibility of 6 sorts of dried potatoes were as follows: Organic matter 91.3, protein 58.8, nitrogen-free extract 94.5, and crude fiber 73.2 per cent. In experiments with sheep the average values were organic matter 86.5, protein 31.9, nitrogen-free extract 94.4, and crude fiber 16.1 per cent.

Digestion experiments, II, H. G. KNIGHT, F. E. HEPNER, and T. F. MCCONNELL (*Wyoming Sta. Bul. 78, pp. 3–44, figs. 4*).—A continuation of previous work (E. S. R., 18, p. 262). Native hay, oat straw, pea hay, and sweet clover, and alfalfa from different cuttings were fed to sheep. The digestion coefficients found in this and the previous work were as follows:

Digestibility of native hay, oat straw, pea hay, sweet clover hay, and alfalfa hay.

	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Native hay (wire grass)	53.27	38.76	54.19	54.31	58.30	33.81
Native hay (wheat grasses)	63.64	57.12	47.04	66.46	67.49	38.90
Oat straw	54.83	25.72	49.97	57.21	54.13	48.79
Pea hay	67.10	78.24	49.55	79.27	50.73	33.39
Sweet clover hay	60.88	75.46	30.94	72.04	33.63	65.79
Alfalfa hay (first cutting)	61.95	77.56	38.46	73.29	46.04	47.04
Alfalfa hay (second cutting)	64.25	79.55	44.75	75.60	46.12	55.33

The western sedges (Carex) and rushes (Juncus), grown for hay throughout the irrigated regions of the Laramie Plains, were found to be nutritious, although the eastern species are supposed to have little value for stock. Oat straw is deemed more nutritious than eastern workers have found it to be. Canadian pea hay is believed to be one of the most important hays for fattening lambs. White sweet clover (*Melilotus alba*), one of the few alkali-resisting plants, has a peculiar taste which stock do not seem to relish, but if cut early, placed in the stack and salted, it is quite palatable.

The forage plants which composed the native hay (wire grass), arranged in the order of their predominance, were as follows: *Juncus balticus* (Baltic rush), *J. longistylis* (long-style rush), *Deschampsia cæspitosa* (tufted hair grass), *Carex nebraskensis* (Nebraska sedge), *Astragalus bodini* (Bodin vetch), *Triglochin palustris* and *T. maritima* (weeds), *Agropyron occidentale* (western wheat grass), and small amounts of many others. The first 6 species comprised fully 90 per cent of the whole.

The forage plants in the native hay in which wheat grasses predominate included *Agropyron* sp. (species of wheat grasses), *Deschampsia cæspitosa*, *Puccinellia airoides* (alkali meadow grass), *Juncus balticus*, *J. longistylis*, *Elcocharis palustris* (spike rush), and small amounts of several others. About 75 per cent of the whole consisted of the true grasses, mainly wheat grasses, the balance being rushes and sedges.

A feeding experiment with hay, turnips, and cut straw for sheep, J. SÄLAND (*Ber. Norges Landbr. Höiskoles Virks., 1906–7, pp. 225–240*).—A test

with 3 ewes and their 5 lambs showing that turnips may make a profitable sheep feed under the agricultural conditions of eastern Norway.

Fertility in Scottish sheep, F. H. A. Marshall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 20 (1908), pp. 139–151*).—A series of statistics based upon inquiries made by sheep breeders was compiled by the author for the purpose of showing some of the principles involved in determining fertility in sheep. The percentage of lambs per 100 ewes and the percentage of barren ewes in various flocks of different breeds and kept under different conditions are shown in tabular form. It was found that certain changes of weather during the breeding season may have an unfavorable effect upon the percentage of lambs and that the practice of flushing ewes almost invariably has the effect of increasing the percentage of twin lambs and triplets. Considerable evidence was obtained to show that a high fertility is ordinarily hereditary.

Caracul sheep, E. Meuleman (*Le Mouton Karakul. Brussels, 1908, pp. 20, figs. 8*).—An account of raising Persian, caracul, and similar sheep which yield the fur known as Persian lamb, broadtail, astrakhan, etc. The author believes that raising such sheep might be advantageously carried on in parts of Belgium.

Caracul sheep and their possible use in the sandy regions of Germany, J. Kühn (*Illus. Landw. Ztg., 28 (1908), No. 24, pp. 213, 214, figs. 4*).—The author does not believe that caracul sheep would be suited to German conditions, as they apparently require their usual environment in order to produce lambs with the characteristic pelts.

Raising and fattening calves on skim milk with and without supplementary feeds, P. Dornic and P. Daire (*Indus. Lait. [Paris], 33 (1908), No. 10, pp. 183–187*).—Barley flour, rice flour, and linseed oil were used as supplements to skim milk and in the tests which are briefly cited the calves gained from 0.6 to 1 kg. per head per day. The addition of oil to the ration did not materially improve the quality of meat nor influence the gains in weight.

Beef production. II, Methods of beef production in Indiana. III, Factors influencing the value and cost of feeders, J. H. Skinner and W. A. Cochel (*Indiana Sta. Circs. 12, pp. 32; 14, pp. 23, figs. 22*).—Circular 12 is a summary of replies received from 929 successful feeders of Indiana to a list of 100 questions submitted relative to the extent of the business of feeding cattle, the equipment used, and the methods of feeding in vogue. Circular 14 discusses the conformation, quality and breeding, age, condition and weight of steers, market conditions, and other factors influencing the value and cost of feeders.

Fifty years among Shorthorns, R. Bruce (*London, 1907, pp. 214, pls. 21*).—On the basis of personal knowledge the author describes a very large number of notable Shorthorn animals of Great Britain.

Congo cattle, E. Meuleman (*Le Betail du Congo. Brussels, 1907, pp. 23, figs. 13*).—A summary of data on the zebras and the cattle in the Congo. The advantages of introducing improved breeds of cattle and related questions are considered.

Inverted starch in pig feeding, S. S. Sevenster (*Milch Ztg., 37 (1908), No. 8, p. 88*).—A brief note on the use of diastasolin for inverting starch. The use of smaller amounts than usual of the ferment is to be preferred, according to the author's experience.

Supplements to corn for fattening hogs in dry lot, J. H. Skinner and W. A. Cochel (*Indiana Sta. Bul. 126, pp. 143–159*).—Tankage, linseed meal, and soybean meal were compared as supplements to corn meal for fattening hogs. The tests were conducted at different seasons of the year with hogs of various ages and conditions of finish. The results are shown in the following table:

Comparison of tankage, linseed meal, and soy beans as supplements to corn for fattening hogs.

	Ratio of supplementary ration to basal ration (corn meal).[a]	Number of days fed.	Number of pigs.	Daily gain per head.	Amount of feed per pound gain.	Cost per pound gain.
				Pounds.	*Pounds.*	*Cents.*
Experiment 1:						
Period 1—						
Lot 1	Tankage 1:10	35	8	1.57	3.58	3.68
Lot 2	Linseed meal 2:10	35	8	1.48	3.82	3.89
Period 2—						
Lot 1	Tankage 1:10	48	8	1.60	4.33	4.35
Lot 2	Linseed meal 2:10	48	8	1.36	4.68	4.68
Experiment 2:						
Period 1—						
Lot 1	Tankage 1:16	30	9	1.65	3.76	3.62
Lot 2	Linseed meal 1:8	30	10	1.42	3.86	3.76
Period 2—						
Lot 1	Tankage 1:32	21	9	1.12	4.00	3.73
Lot 2	Linseed meal 1:16	21	10	1.20	3.79	3.54
Experiment 3:						
Lot 1	Tankage 1:20	29	7	1.53	3.75	3.57
Lot 2	Linseed meal 1:10	29	7	1.38	4.22	4.02
Experiment 4:						
Lot 1	Tankage 1:15	60	5	1.83	3.83	3.70
Lot 2	Linseed meal 1:8	60	5	1.75	3.75	3.62
Experiment 5:						
Lot 1	Linseed meal 1:5	39	4	1.23	3.82	3.82
Lot 2	Soy-bean meal 1:5	39	4	1.33	3.46	3.46
Experiment 6:						
Lot 1	Linseed meal 1:8	60	5	1.75	3.75	3.62
Lot 2	Soy-bean meal 1:7	60	5	1.82	3.68	3.59
Summary of experiments 1, 2, 3, and 4.	Tankage			1.61		3.82
	Linseed meal			1.49		3.96
Summary of experiments 5 and 6.	Linseed meal			1.48	3.78	3.71
	Soy-bean meal			1.56	3.60	3.55

[a] In the first period of the first experiment 5 parts of middlings were added to the ration.

It is concluded that the tests with soy-bean meal indicate that it is possible to grow in Indiana a feed which is equal in value to linseed meal as a supplement to corn for fattening growing hogs in a dry lot. Corn should be the basis of all rations for fattening hogs, but a larger proportion may be used with tankage than when linseed meal is used as a supplement. With tankage the hogs consumed more feed, made a more rapid gain, and were better finished than when linseed meal was used. Soy-bean meal proved to be a more efficient supplement than linseed meal both as regards the rate and cost of gain.

Hog feeding, W. J. Quick and A. P. Spencer (*Virginia Sta. Bul. 176, pp. 3–14, figs. 2*).—In 70-day tests with 4 lots of 5 Berkshire hogs, 5 months of age, skim milk was compared with blood meal as a supplement to corn, and well-seasoned, hard, and flinty corn was compared with new corn coming directly from the shock. With a basal ration of skim milk and middlings, the lot receiving new corn made an average daily gain of 1.47 lbs. per day at a cost of 5.99 cts. per pound of gain, whereas the lot receiving old corn made an average daily gain of 1.5 lbs. at a cost of 5.6 cts. per pound of gain. With blood meal and middlings for a basal ration, the average daily gain of the lot receiving new corn was 1.37 lbs. at a cost of 5.9 cts. per pound, whereas the lot receiving old corn made a daily gain of 1.4 lbs., costing 5.7 cts. per pound of gain. Analyses of the feeds are given.

"The profit made during the entire experiment differs less than one dollar. From this data we concluded that blood meal and skimmed milk have a similar feeding value when fed on the basis of an equal number of pounds of protein, and as supplements to either old or new corn."

Paddock feeding of pigs, E. R. Sawer (*Natal Agr. Jour. and Min. Rec., 10 (1907), No. 7, pp. 701, 702*).—Peanuts, sweet potatoes, beans, and arrowroot were compared as pasturage for pigs at the Winkel Spruit Experiment Farm, the pasturage being supplemented by small amounts of other feed. The total gain made by 12 pigs on peanuts was 69.7 lbs. per week and on sweet potatoes 101.5 lbs. The experimental periods covered from 2 to 3 weeks.

Fattening pigs, Brandt (*Deut. Landw. Presse, 35 (1908), No. 6, pp. 55, 56*).—In an article quoted from *Hannoversche Land- und Forstwirthschaftliche Zeitung* data are summarized regarding the feeding of pigs in accordance with theoretical requirements.

Standardizing breed characteristics, W. J. Spillman (*Proc. Soc. Prom. Agr. Sci., 28 (1907), pp. 115–121, figs. 3*).—Attention is devoted to the recurrence of black specimens among pure-bred Hampshire swine. Since a distinct white band is required in this breed, various attempts have been made to eliminate the tendency to produce black specimens. From a consideration of the inheritance of Mendelian characters it is believed that the desired result may best be brought about by testing all male breeding animals. If a male when bred to a recessive female produces any young showing recessive characters, he should be discarded. The same result may be brought about by discarding all male and female Hampshire hogs which show the recessive character of white feet. If this course is adopted, it will be unnecessary to use black breeding animals to eliminate the white feet.

Breeds of horses, P. Diffloth (*Races Chevalines. Paris, 1908, pp. VIII+467; rev. in Nature [London], 77 (1908), No. 1998, p. 339*).—A classification and discussion of breeds of horses, together with statistics of the number of horses in the world and short chapters on the ass and mule. Data are also presented regarding the government efforts in France to encourage horse breeding. This volume is included in the series Encyclopédie Agricole.

The horses of the British Empire, edited by H. F. de Trafford et al. (*London, 1907, vols. 1, pp. VIII+286, pls. 18, figs. 203; 2, pp. VIII+245, pls. 10, figs. 551*).—The origin and history of domestic horses and the principal breeds of horses, particularly those of importance in the British Empire, are discussed and a large amount of data on horses and horse breeding is summarized. The chapters are contributed by different authors and the work is very fully illustrated.

Types and breeds of horses in the Russian Empire, edited by N. A. Goulkevich ([*1907*], *pp. IV+30, pls. 68*).—By means of illustrations and text the author describes the principal types of Russian horses. The text of the volume appears in Russian, English, German, and French.

Horse feeding with saccharin substances (*Sugar Beet, 29 (1908), No. 4, pp. 295, 296*).—Experiments carried on by Latschenberger and S. Polansky at the Vienna Veterinary School are summarized. When lump sugar was fed to 2 horses, the maximum amount being 4 kg. per day for a horse weighing 475 kg., the animals remained in a satisfactory condition, gained somewhat in weight, and did not drink excessive amounts of water. The basal ration consisted of 3.6 kg. of oats and 4.5 kg. of hay.

Tests were also summarized in which peat molasses was fed in addition to oats and hay, a kilogram per head per day giving very satisfactory results.

The use of bonnets for horses, B. d'Anchald (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 10, pp. 880–883; abs. in Rev. Gén. Agron., 17 (1908), No. 2, pp. 76, 77*).—Studies of body temperatures of horses with and without bonnets showed the animals were cooler without them. The author considers that bonnets are neither necessary nor desirable.

Market classes of mules and breeding them (*Breeder's Gaz., 53 (1908), No. 10, pp. 535, 536, figs. 2*).—This general discussion is based on the experience of a practical mule raiser.

Animal food for chickens, F. Houssay (*Arch. Zool. Expt. et Gén., 4. scr., 6 (1907), pp. 137–332, figs. 47; abs. in Rev. Gén. Agron., 17 (1908), No. 2, pp. 81, 82*).—Experiments which included 6 successive generations of chickens were made in which exclusively animal and vegetable rations were compared.

It was found that during the period of growth the chickens fed the animal food developed very rapidly. Under favorable conditions certain parts of the body, for instance, the epidermis of the foot, made vigorous growth and after several generations a tendency to produce feathered feet was noticeable. The fat of chickens fed animal food was the more firm, but the egg production was smaller and abnormal eggs, for instance, infertile or double-yolked eggs were more commonly produced. As a practical deduction, the author concludes that chickens may receive animal food with profit during the period of growth but that it is not habitually needed afterwards.

Poultry experiments, W. P. Brooks, E. S. Fulton, and E. F. Gaskill (*Massachusetts Sta. Rpt. 1907, pp. 57–59*).—The practical conclusions here reported have for the most part been noted from another source (E. S. R., 20, p. 272).

The poultry export trade, A. Hart (*Jour. Dept. Agr. Victoria, 6 (1908), No. 1, pp. 49–53, figs. 3*).—In the feeding test briefly summarized in connection with a discussion of the importance of properly fattened birds for export trade and related questions, it was found that extra gains in weight cost about 7 cts. per pound with chickens and about 5 cts. with ducklings.

Some suggestions are made regarding poultry feeding and some results obtained by other investigators are summarized.

Poultry culture, C. K. Graham (*Connecticut Storrs Sta. Bul. 52, pp. 115–134, figs. 24*).—A revised and enlarged edition of Bulletin 36 of the station (E. S. R., 17, p. 388). Notes regarding methods of preparing poultry for market have been added. A hook used to hold birds for plucking is figured and described.

Practical poultry houses and fixtures, A. F. Hunter (*Syracuse, N. Y., 1907, pp. 96, pl. 1, figs. 66*).—Poultry houses and poultry house construction, nests, feed, hoppers, and other similar topics are discussed, the descriptions being supplemented by illustrations and plans.

Experiments with ostriches. V. Scaliness and unopened feathers in the ostrich, J. E. Duerden (*Agr. Jour. Cape Good Hope, 32 (1908), No. 3, pp. 355–359, fig. 1*).—Marked scaliness of the skin and nonremoval of the outer feather sheath, which is normally done by preening, are regarded as indications of poor health, a condition likely to interfere with the production of well-grown feathers free from defects. The remedy for the trouble is the general improvement of the health of the ostriches, particularly by attention to the feed.

Farmer's cyclopedia of live stock, E. V. Wilcox and C. B. Smith (*New York and London, 1908, pp. X+745, pls. 6, figs. 450*).—In encyclopedic form the authors have summarized information on the history, anatomy and physiology, and breeding of domestic animals, principles of stock feeding, diseases of animals, business aspects of stock farming, animal products, and the different kinds and groups of farm animals.

The authors state it has been their endeavor "to present all the important facts in their logical bearing on each problem of animal production. The selection of material has been made from the viewpoint of its value to the practical stock raiser in solving the almost innumerable specific problems which he finds.

"The basis of this volume is to be sought in the bulletins and reports of the agricultural experiment stations, Federal and State departments of agriculture, live-stock periodicals, other publications of this and foreign countries, and in our own personal experience. The book, therefore, embodies those experimentally established facts and principles of animal husbandry which at present are our most reliable guides to profitable practice.

"American stock raisers are in a position to produce economically the finest of animal products of all sorts. The recent meat inspection law has enabled the Bureau of Animal Industry to devise and put in operation the most efficient system of meat inspection known to the world. This book is designed to encourage the stockman to do his part in increasing the national resources."

Animal husbandry in Denmark, 1907, A. Appel (*Maelkeritid., 21 (1908), No. 3, pp. 43–58*).—A discussion of the conditions of the industry during 1907.

Pastoral industry (*Off. Yearbook N. S. Wales, 1905–6, pp. 373–401, pls. 2*).—Statistics of the sheep and other farm animals in New South Wales and their value, the meat export trade, and related topics.

DAIRY FARMING—DAIRYING—AGROTECHNY.

A test of soiling crops for dairy cows, T. L. Mairs and F. S. Putney (*Pennsylvania Sta. Rpt. 1907, pp. 73–85*).—Further feeding tests of soiling crops (E. S. R., 19, p. 877) were made, leguminous plants being used as far as possible. The crops tested during the year were alfalfa, clover and timothy, field corn, cowpeas, rye, field peas and oats, Kafir corn and cowpeas. The saccharin sorghums fed in former years were abandoned in favor of Kafir corn, which seemed to be more palatable and furnished a better support for the cowpeas with which it was planted. Tables are given showing the yields of green forage, air-dry matter and protein, the length of time required for maturity, and the amounts fed per cow daily.

During the 3 years that alfalfa has been grown it has yielded an average of 1,328 lbs. of protein per acre. During the periods that alfalfa was fed there was a decrease in milk flow, although there was an increase in digestible protein fed. The greatest proportion of increase in the milk flow was noted when dry matter and green forage were increased but the protein diminished. "It can not be said that milk production depends upon the quantity of any one of the three—protein, dry matter, and green forage. The amount fed does not seem to bear any definite relation to the amount refused. An attempt was made to feed the cows according to their appetite, and except in the case of rye and of corn the amount refused was so small as to be of little importance."

Cooperative dairy investigations, P. N. Flint and J. E. Dorman (*Georgia Sta. Bul. 80, pp. 143–172, figs. 13*).—A report of the records of four herds as obtained on dairy farms of the State in cooperative work with the Dairy Division of this Department.

"The best cow produced in 1 year 9,257 lbs. of milk and 544.39 lbs. of butter. The poorest cow produced in 1 year 1,589 lbs. of milk and 88.02 lbs. of butter.

"The best herd produced an average of 4,873 lbs. of milk and 319.02 lbs. of butter per cow. The poorest herd produced an average of 3,653 lbs. of milk and 221.36 lbs. of butter per cow. The average production of all herds recorded was 4,385 lbs. of milk and 276.03 lbs. of butter per cow.

"The cost of producing a pound of butter varied from 10.07 cts. in the case of herd D to 15.3 cts. in the case of herd C. The cost of producing 100 lbs. of milk varied from 65.9 cts. in case of herd D to 94.2 cts. in the case of hered C. The average value of the product of the herds was $889.77, cost of feed $35.88, and profit $53.89."

Milk Production. I, Herd improvement. II, Feeding, H. A. HOPPER (*Indiana Sta. Circs. 11, pp. 8, figs. 4; 13, pp. 21, figs. 3*).—Circular 11 presents popular suggestions with reference to means of improving the dairy herd. Circular 13 is a discussion of facts and principles thus far found useful in profitable milk production.

Cows v. cows, W. J. FRASER (*Illinois Sta. Circ. 118, pp. 3–26, figs. 14*).—An address given at various dairy meetings. The author thinks that profits on an average dairy farm to-day can easily be doubled by keeping better cows. This can be done by selling off the poorest cows and raising heifers from the best stock instead of buying stock of doubtful ancestry.

Improving dairy conditions, J. M. TRUEMAN (*Connecticut Storrs Sta. Bul. 53, pp. 139–164, figs. 20*).—This is written for the milk producer, and discusses the characteristics of good dairy stock, how to feed and care for it, the sanitation and ventilation of dairy buildings, and the best methods of handling milk. There are tables showing the cost of feeding heifers at the college and the cost of milk produced by cows in the college herd under 5 years of age.

Reconstruction of dairy barns (*Bul. [Maine] Dept. Agr., 7 (1908), No. 2, pp. 41–63, figs. 13*).—The principal features of this publication are a discussion of the King system of ventilation, and hints for reconstructing the tie-up, light in dairy barns and features in all dairy barns that should receive special attention, such as stalls, mangers, floors, gutters, storage of feed, etc.

Amyl alcohol in testing [cream,] C. H. ECKLES and H. S. WAYMAN (*Chicago Dairy Produce, 15 (1908), No. 7, p. 20.*)—A small quantity of amyl alcohol colored bright red by the addition of an anilin color is dropped on the top of the column of butter fat in the test flask. Being lighter than the fat, it floats above it and thus removes the meniscus from the fat and leaves a straight line across the top of the column, thereby allowing more accurate reading of the fat than when measurement is made to the bottom of the meniscus. The readings thus made compare very closely with the results of the gravimetric determination of fat.

The Babcock test, W. B. LIVERANCE (*Michigan Sta. Circ. 2, pp. 7–16, figs. 6*).—Directions are given for using the Babcock test to determine the percentage of fat in whole milk, skim milk, buttermilk, cream, cheese, and whey.

The cost of testing pure-bred cows, J. B. LINDSEY (*Massachusetts Sta. Circ. 15, pp. 2*).—This is a supplement to Circular 9 (E. S. R., 19, p. 879), and contains a schedule of prices adopted by the Massachusetts Station for making tests for dairymen.

Standard for Babcock glassware, E. B. HOLLAND (*Massachusetts Sta. Rpt. 1907, pp. 113–119*).—A State law which took effect July 1, 1901, requires that Babcock glassware should be tested for accuracy. Up to December 1, 1907, 18,855 pieces of glassware had been tested, of which 1,770 pieces, or 9.39 per cent, were condemned. It is found that manufacturers of glassware do not use the same standard of graduation, and upon the request of the station a tentative standard of graduation has been proposed by the U. S. Bureau of Standards, which recommends that a true cubic centimeter at 20° C., equivalent to 0.998877 gm. of water at 4° C., be used for the graduation of all Babcock glassware. Suggestions are also made as to methods of testing and the limit of error.

Supervision of the milk supply (*Rpt. Bd. Health Montclair, N. J., 13 (1907), pp. 42–47*).—Some details regarding the methods and results of controlling the milk supply in Montclair, N. J., are given. According to the account presented considerable improvement has been made in the quality of the milk delivered in the city.

Fourth International Dairy Congress, 1909 (*Indus. Lait. [Paris], 33 (1908), No. 24, pp. 457–460*).—This gives the rules and programme adopted by

the Hungarian Committee of the International Dairy Convention for the Fourth International Dairy Congress to be held in Budapest in June, 1909. As in the previous congress, the first section will be devoted to dairy legislation and regulations, the second to dairy hygiene and veterinary science, and the third to dairy industry.

The National Creamery Buttermakers' Association, 1908 (*Nat. Cream. Buttermakers' Assoc. Rpt., 1908, pp. 5–119, fig. 1*).—This report includes an account of the proceedings of The National Creamery Buttermakers' Association and a number of addresses on various subjects such as starters and cream ripening, how can the buttermaker hold his patronage against unwholesome competition, how to control uniform overrun and quality in butter, creamery records, creamery employees, and others, most of the addresses being followed by considerable discussion.

The chemical composition of milk. J. B. LINDSEY (*Massachusetts Sta. Rpt. 1907, pp. 104–108*).—This contains tables showing analyses of milk from the principal dairy breeds, as compiled from various American and European sources.

The effect of food upon the composition of milk and butter fat, and upon the consistency or body of butter. J. B. LINDSEY (*Massachusetts Sta. Rpt. 1907, pp. 109–112*).—The results of a long series of experiments are summarized as follows:

"(*a*) *Effect on the milk.*—Different amounts of protein in the daily ration derived from linseed, cotton-seed, soy-bean, and corn-gluten meals do not seem to have any pronounced effect in changing the relative proportions of the several milk ingredients.

"Linseed oil in flaxseed meal, when fed in considerable quantities (1.4 lbs. digestible oil daily), increased the fat percentage from 5 to 5.56 and slightly decreased the nitrogenous matter of the milk. This fat increase was only temporary, the milk gradually returning (in 4 or 5 weeks) to its normal fat content. The nitrogenous matter also gradually returned to normal, but more slowly than did the fat.

"Three lbs. of cotton-seed meal with minimum oil (8 per cent), when fed daily to each animal, had no noticeable influence on the composition of the milk.

"The addition of 0.5 to 0.75 lb. of cotton-seed oil to the cotton-seed meal ration appeared to increase the fat percentage of the milk about 0.4 per cent (5 to 5.4), and this increase was maintained during the 6 weeks of the feeding period.

"The substitution of linseed meal with a minimum percentage of oil (3 per cent) in place of the cotton-seed meal and cotton-seed oil resulted in a decline of the fat in the milk to its normal percentage. This change probably was due to the removal of the cotton-seed oil from the ration, and not to the influence of the linseed meal.

"The addition of 0.6 lb. of corn oil to a ration made up of a mixture of grains low in fat increased the fat percentage of the milk 0.23 per cent (5.17 to 5.40). At the end of 2 weeks the effect of the corn oil had disappeared and the milk had returned to its normal fat content.

"The sudden removal of the corn oil from the daily ration caused a drop of 0.54 per cent in the fat (4.97 to 4.43), but after the first week the normal fat percentage was again present.

"Corn oil appeared to have depressed the nitrogen percentage of the milk by 0.034 per cent (0.610 to 0.576). The nitrogen gradually returned to its normal percentage after the feeding of the corn oil had ceased.

"Corn meal (a carbohydrate feed) was without effect on the composition of the milk.

"Two to 3 lbs. of soy-bean meal with a minimum oil percentage (8 per cent), fed daily to each animal, did not appear to in any way modify the proportions of the several milk constituents.

"The addition of 0.5 to 1 lb. daily of soy-bean oil to a basal ration of grain and hay very slightly increased the fat percentage in the milk during the first 2 or 3 weeks (0.1 per cent). No other variation was noted.

"The sudden removal of the soy-bean oil from the ration caused a drop of 0.25 per cent of the fat percentage of the milk. At the end of 3 weeks the milk had not regained its normal fat percentage.

"(*b*) *Effect on butter fat.*—Corn gluten and linseed meals with a minimum percentage of oil (3 per cent) produced a normal butter fat. Cotton-seed and soy-bean meals with a minimum oil percentage (8 per cent) likewise effected little change in the composition of the butter fat. Corn meal was without noticeable influence on the composition of the butter fat.

"Linseed oil (1.4 lbs. digestible oil per head daily) produced a noticeable change in the composition of the butter fat, causing a decrease in the volatile acids and an increase in the melting point and olein percentage (soft fat).

"Cotton-seed oil (0.5 lb. daily per head) increased the melting point and the olein percentage of the butter fat.

"Corn oil (0.6 lb. per head daily) decreased the volatile fats and increased the percentage of olein; the melting point of the fat remained unchanged.

"Soy-bean oil (0.5 to 1 lb. daily per head) caused a drop in the saponification number of some 10 points, a decrease in the soluble fatty acids and in the volatile fatty acids (Reichert-Meissl number), an increase in the iodin number (percentage of olein) from 32 to 40, while little or no change was noted in the melting point of the butter fat.

"A rise in the iodin number (increase in olein) is a reasonably sure indication of a soft-bodied butter which will lack in firmness at a temperature of 70° F. An increase in the melting point of the butter fat is not a sure indication of a harder, firmer butter. It seems evident that the proportions of the several fats is more or less changed by an excess of oil in the feed and that this change of proportions varies the melting point in the fat in some such way as the melting point of a mixture of metals is changed by the resulting amalgamation.

"(*c*) *Effect on butter.*—The effect of linseed meal with a minimum percentage of oil (3 per cent) on the general character of the butter was not positively identified.

"Cotton-seed meal with a relatively high oil percentage (12.6 per cent) produced butter that was rather crumbly when hard, and slightly salvy to the taste. Cotton-seed meal with a minimum percentage of oil (8 per cent) likewise produced a hard, firm butter.

"Corn gluten meal with a minimum percentage of oil (2 to 3 per cent) produced a rather soft, yielding butter.

"Soy-bean meal with minimum oil (8 per cent) produced butter that was rather softer and more yielding to the touch than that derived from a grain ration composed entirely of bran, ground corn and oats, gluten feed and cotton-seed meal.

"An excess of linseed oil (1.4 lbs. digestible oil per head daily) produced a very soft, salvy butter, with an inferior flavor.

"The addition of cotton-seed oil (0.5 lb. per head daily) to a normal ration, or to one containing 3 lbs. of cotton-seed meal in oil, produced a softer, more yielding butter than that produced by the ration with the oil omitted.

"The addition of corn oil (0.6 lb. daily per head) to a normal ration containing 2 lbs. of corn gluten meal low in oil produced a noticeably softer butter than when the oil was omitted.

"Corn meal tended to produce a reasonably hard, firm butter, of an agreeable flavor.

"Soy-bean oil (0.5 to 1 lb. daily per head) added to a grain ration produced a butter that was noticeably soft and yielding to the touch, and that would not stand up well at 70° F. and above."

The following general conclusions are drawn:

"Neither the proteid nor the carbohydrate groups, when fed in normal amount, have any noticeable influence in changing the proportions of the several milk ingredients, nor in modifying to any marked degree the character of the butter fat as revealed by the ordinary chemical tests; such changes, so far as they are the result of food, are due to the presence of oil in the feed stuff.

"Some proteids produce a harder, firmer butter than others, while the tendency of starchy foods is to produce a firm-bodied butter. Vegetable oils in excess of the normal amount produce a noticeably soft-bodied butter.

"It is not considered advisable to feed large quantities of oil to cows, it having a tendency to derange the digestive and milk-secreting organs.

"The flavor of butter depends primarily on the cleanliness of the milk, stage of lactation of the animal, skill and care of the butter maker, and especially upon the character of the starter employed. Normal feed stuffs must be considered of secondary importance in establishing butter flavor."

The action of Bacillus casei ϵ and Mycoderma thöni in the manufacture of Grana cheese, G. Fascetti (*Rev. Gén. Lait, 6 (1907), No. 23, pp. 529–533, pl. 1*).—Under the influence of these two organisms cheeses prepared according to the method of making Grana cheese, but sown with these organisms during the course of preparation, had at the end of 3 months acquired the character of Gruyère cheese as regards structure and savor, while other cheeses made at the same time but not ripened under the influence of these organisms developed as characteristic Grana cheese.

Olmützer cheese, J. V. Pavelka (*Abs. in Rev. Gén. Lait, 6 (1907), No. 23, pp. 538–545, figs. 4*).—The method of making this kind of cheese in the village of Olmütz, in Moravia, is described and illustrated.

Cheese making in Cuba, N. S. Mayo and C. G. Elling (*Estac. Cent. Agron. Cuba Bul. 2, pp. 3–28, pls. 6, figs. 9*).—This publication describes in more or less detail the processes which the authors believe best adapted for making cheese in Cuba.

Mannitic fermentation in apple and pear cider, Truelle (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 4, pp. 263–267*).—This is an extract from a report of investigations by Müller-Thurgau, published elsewhere. Special attention is called to the conclusions of this investigator that mannitic fermentation appears quite frequently in apple and pear cider prepared from fruits slightly acid, from sweet apples or from ripe pears, and is always accompanied by the formation of a large quantity of lactic and acetic acids as well as their ethers. These defects result from the action of certain bacteria or ferments which develop, when slightly acid juice from very ripe fruit has a relatively high temperature. Various methods of preventing the fermentation are suggested, as selecting proper fruit, using potassium metabisulphite or sulphurous acid, and other ways.

Honey vinegar, A. E. Vinson (*Arizona Sta. Bul. 57, pp. 247–255, fig. 1*).—The crude methods of making honey vinegar now in use often result in a great loss of saccharin material. As honey diluted with ordinary well water is deficient in mineral and nitrogenous matter, the effect of adding ammonium chlorid and potassium phosphate on the activity of the yeast cells was studied. Honey was diluted 1:5 with well water supplying sufficient lime and mag-

nesia, and 250 cc. portions were inoculated with a yeast culture. Two flasks receiving no additional mineral matter showed an average total carbon dioxid loss of 10.17 gm. in 3 weeks, 14.12 gm. in 6 weeks, and 17.73 gm. in 13 weeks, at which time the wine produced contained 7.23 per cent of alcohol by weight. Two flasks receiving each 0.25 gm. of ammonium chlorid lost on an average 13.58 gm. carbon dioxid in 3 weeks, 16.01 gm. in 6 weeks, and 17.66 gm. in 13 weeks, the wine containing 6.89 per cent of alcohol. In two flasks each receiving 0.25 gm. ammonium chlorid and the same amount of potassium phosphate there was an average loss of 17.82 gm. carbon dioxid in 3 weeks and 18.26 gm. in 6 weeks, and an alcohol content of 7.5 per cent. It is concluded that ammonium chlorid accelerates fermentation in the early stages. Where both ammonium chlorid and potassium phosphate were used the fermentation was practically complete at the end of the third week.

A comparison of wild yeasts with commercial yeasts showed that although fermentation was nearly as complete at the end of 2 weeks with wild yeasts the percentage of alcohol was lower and other fermentation products were contained in the wine. It is deemed advisable to add a little pure yeast as a starter. It is stated that a very palatable cider may be produced from fermented honey, but the cask must be thoroughly cleansed by steam or hot water.

Full directions are given for making honey vinegar by the following formula: Strained honey 40 to 45 lbs., water 30 gal., ammonium chlorid 4 oz., potassium bicarbonate 2 oz., sodium phosphate 2 oz., and one quarter cake dry yeast softened in lukewarm water. A modification devised by the station of a French generator for making small amounts of vinegar is described.

Vinegar from whey, F. Marre (*Indus. Lait. [Paris], 33 (1908), Nos. 24, pp. 467–468; 25, pp. 477–478*).—In the author's opinion vinegar can be made from whey with a considerable margin of profit, but special attention must be given to the use of proper ferments and to the conditions under which the whey is fermented.

VETERINARY MEDICINE.

Annual report on progress in the study of pathogenic micro-organisms, P. von Baumgarten and F. Tangl (*Jahresber. Path. Mikroorgan., 21 (1905), 1. Abt., pp. 1–400; 2. Abt., pp. XII+401–941*).—Bibliographical lists are given together with abstracts of the more important articles published during the year 1905 on parasitic protozoa, fungi, and bacteria affecting animals and man. An account is also given of the progress made during the year in the field of general micro-biology and technique and practice of disinfection.

The poisonous effects of blood of different species, G. Lefmann (*Beitr. Chem. Physiol. u. Path., 11 (1908), No. 7–9, pp. 255–273*).—The intravenous injection of lipoid substances from the blood of another species of animal introduced in dogs, cats, and rabbits causes symptoms which consist largely in the lowering of the blood pressure, an increase in the rate of respiration and heart beat, and paralysis and narcosis. Lipoid substances from the blood corpuscles of other individuals of the same species are not poisonous for dogs and rabbits, but are slightly so for cats. The poisonous substances were found to be soluble in ether and alcohol but insoluble in chloroform.

Immunization against calf dysentery, swine plague, etc., Bugge (*Landw. Wchnbl. Schles. Holst., 58 (1908), No. 18, pp. 353–356*).—A general account is given of the significance of natural acquired immunity and active immunity in relation to calf dysentery, calf pneumonia, and swine plague.

Injurious fodder and poisonous plants, H. T. Güssow (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 32–63, figs. 11*).—Among the harmful conditions

which may arise in fodder, mention is made of ergot, smuts, molds, and other parasitic fungi. A rather extensive list of poisonous plants is given with brief notes on the physiological effects of these plants and the means of combating them.

Report of the veterinarian, S. B. Nelson (*Washington Sta. Rpt. 1905, pp. 16–20*).—In an investigation of a disease affecting new-born animals, especially pigs, in the central part of the State, water taken from the section where the disease prevailed was analyzed by the station chemist and found deficient in mineral salts. The disease is attributed to malnutrition, due to this cause, and recommendations are made that pregnant sows be fed precipitated calcium phosphate.

Two experiments were conducted to determine the effect of treatment of decayed teeth of horses, in which the amount of hay wasted and the weight of the animal were recorded during a period prior to the operation upon the teeth, during the period of recovery, and following recovery.

In the first experiment, "with the same amount of hay fed during the first period of 14 days, with 280 lbs. fed and 66 lbs. wasted, the horse averaged 998.7 lbs. During the second period of 11 days after the operation with 220 lbs. fed, and a waste of 83 lbs., the average weight was 995.3, or 3.4 lbs. less than during the first period.

"The third period of 14 days, with 280 lbs. of hay fed, and 9 lbs. of waste, the average weight was 1,013 lbs., a gain over the first period of 14.3 lbs. and on the second of 17.7 lbs. The waste during the first period was 2.43 per cent; second period, 33.33 per cent; and the third, only 3.2 per cent of the hay fed."

A second horse operated on gave an average weight of 1,099 lbs. for the 15 days prior to the operation, and an average of 1,112 lbs. for the 14 days following, or an average gain of 13 lbs.

Annual report for 1907 of the principal of the royal veterinary college, J. McFadyean (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 201–210*).—In this report the author compares the conditions observed during the year with those observed in other years with respect to anthrax, glanders, swine fever, Johne's disease, and redwater in cattle. With regard to the transmissibility of bovine tuberculosis to man the results obtained by recent investigations are considered as indicating the correctness of the conclusion that such transmission may and does take place.

The standardization of tetanus antitoxin, M. J. Rosenau and J. F. Anderson (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 43, pp. 59*).—An American unit for the standardization of tetanus antitoxin was officially defined in 1907. According to this definition "the immunity unit for measuring the strength of tetanus antitoxin shall be 10 times the least quantity of antitetanic serum necessary to save the life of a 350-gm. guinea pig for 96 hours against the official test dose of a standard toxin furnished by the Hygienic Laboratory of the Public Health and Marine Hospital Service." In the present bulletin a historical view is given of previous work on tetanus toxin and antitoxin, on the methods of standardization which have been adopted, and on the necessity for the present standard. Descriptions are also given of German, Italian, and French methods for standardizing tetanus antitoxin together with tables for guidance in diluting the toxin and antitoxin.

The cause of milk sickness or trembles, E. O. Jordan and N. M. Harris (*Jour. Amer. Med. Assoc., 50 (1908), No. 21, pp. 1665–1673*).—A brief historical account is given of the occurrence of this disease in various parts of the United States. The authors had opportunity to study the disease in New Mexico and Texas at points far removed from the region where it has ordinarily been

reported. The symptoms of milk sickness were studied in man, cattle, and horses and experimentally the disease was produced in laboratory animals by inoculation.

The chief lesions which were observed in cases of milk sickness in animals were in the liver, heart, musculature, kidneys, and small intestines. These lesions were of a parenchymatous nature such as is usually produced by the action of a toxin. Particularly in the liver, cloudy swelling and fatty metamorphosis were very pronounced. A micro-organism, referred to as *Bacillus lactimorbi*, was isolated and its behavior studied in a number of nutrient media. The symptoms of milk sickness were reproduced in rabbits, guinea pigs, dogs, and calves by inoculation with *B. lactimorbi*.

The problems involved in determining the pathology and etiology of this disease will be studied more elaborately. The cases observed by the authors occurred in a region where *Eupatorium ageratoides* does not grow. This plant, therefore, can not be considered as the cause of the disease.

The properties of races of trypanosomes resistant to atoxyl and sera, F. Mesnil and E. Brimont (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 14, pp. 637–640*).—Experiments in the inoculation of laboratory animals for the trypanosomes of surra and nagana indicate that there are races of these trypanosomes which are decidedly resistant to the action of atoxyl. It was also shown that in some cases resistance of trypanosomes to immune sera is hereditary.

The relation between human and bovine tuberculosis, A. Eber (*Verhandl. Deut. Path. Gesell., 1907, pp. 191–194*).—Human tuberculosis material proved in experiments to be highly virulent for 7 cattle and 1 goat and less virulent for 7 other cattle, while 3 cattle and 1 goat were quite resistant. In corresponding experiments with tuberculosis material of bovine origin, a similar variation in virulence was observed in inoculated cattle. The author concludes from his experiments that tuberculosis material from children or from adult persons, particularly those who are suffering from pulmonary tuberculosis, may be virulent for cattle.

Points of entrance of tuberculosis, G. Railliet (*Rev. Tuberculose, 2. ser., 5 (1908), No. 2, pp. 107–156*).—An elaborate review is presented of the results obtained by various investigators in a study of the modes of tuberculosis infection. It is argued that the results thus far obtained indicate that the penetration of the tubercle bacillus through the conjunctiva, genital mucous membranes, healthy skin, or slight skin abrasions must be considered of rare occurrence or of slight importance. The two chief modes of entrance of the tubercle bacillus into susceptible organisms are by means of air into the lungs and by food into the alimentary tract. The relative importance of these two means of infection varies according to age, individual resistance, and various other factors.

Mode of infection and immunity in tuberculosis, Klebs (*Verhandl. Deut. Path. Gesell., 1907, pp. 183–188*).—In carrying on experiments in the artificial inhalation of tubercle bacilli much care is necessary in order to imitate as closely as possible the conditions of natural inhalation, otherwise the results obtained will have little bearing upon the problem of determining the frequency of this method of infection. In the course of the author's experiments a special form of tuberculin has been prepared which in an impure state has the effect of causing a pronounced contraction of the arterial walls, especially in the lungs and liver. When, however, the toxin which causes contraction of the blood vessels is separated from the tuberculin the latter has the effect of increasing the avidity with which the wandering leucocytes take up tubercle bacilli. The leucocytes which are chiefly concerned in the destruction of tubercle bacilli are

multinuclear and are believed by the author to be derived chiefly from the spleen.

Hematogenous tuberculosis, Morpurgo (*Verhandl. Deut. Path. Gesell., 1907, pp. 189–191*).—In experiments with rabbits and guinea pigs it was found that when only a few tubercle bacilli gain entrance to the circulating blood the primary lesions will appear in various parts, the degree of progressiveness depending upon special susceptibility of the animal. If the animal is particularly susceptible, infection progresses rapidly, assuming in most cases the form of miliary tuberculosis with almost constant localization in the lymphatic organs.

The occurrence of latent tubercle bacilli in the lymphatic glands of cattle and hogs, Joest (*Verhandl. Deut. Path. Gesell., 1907, pp. 195–209*).—The literature relating to the occurrence of tubercle bacilli in the lymphatic glands is critically reviewed. The author maintains on the basis of his investigation that from a histological standpoint there is no latent tuberculosis of the lymphatic glands. It is necessary to make a microscopic examination of suspected lymphatic glands in order to determine whether or not tubercle bacilli are present. The investigations reported by the author were made on cattle, hogs, and goats, and led the author to conclude that there is never any latent tuberculous lesion in the lymphatic glands of cattle or hogs affected with generalized tuberculosis.

Eradication of tuberculosis, J. Niven (*Vet. Rec., 20 (1908), No. 1033, pp. 762–769*).—A brief tabular statement is given showing the results of the inspection of dairy cows with respect to the percentage of mammary tuberculosis, clinical tuberculosis, and incipient forms of the disease recognizable only by the tuberculin test. For the control and eradication of tuberculosis among dairy herds the plans suggested by the author include the division of the country into administrative areas each provided with a veterinary staff, the registration and marking of all dairy cows, isolation of tuberculous cows, immediate slaughter of all advanced cases, sterilization of milk from all tuberculous cows, and compensation to owners for slaughtered cattle, at least for a period of 1 or 2 years.

Contagious abortion in cattle, F. W. Wilson (*Arizona Sta. Bul. 57, pp. 279–283*).—Several cases of this disease are reported from different localities in the State. In the station herd the disease is thought to have been communicated to 5 cows through the medium of the sire. Later, under strict sanitary conditions, one of the affected animals was served from this sire and dropped a living calf. A number of cows on neighboring farms have recently been served by this sire and showed no signs of abortion. The cause of the disease and its treatment are discussed.

Retention of the afterbirth in cattle, C. Pomayer (*Das Zurückhalten der Nachgeburt beim Rind. Berlin, 1908, pp. 64, figs. 9*).—The literature relating to the retention of the afterbirth is critically reviewed and a brief bibliography of the subject is given. The author discusses the processes involved in the natural separation of the fetal membranes from the uterine wall, and reports observations made chiefly on microscopic sections showing the connection between the fetal and uterine tissues at different stages in the development of the fetus. According to these observations the afterbirth is retained for an unusual period or there is total inability to expel it in cases in which the process of parturition is unusually long or in which excessive weakness of the animal was brought about by defective nutrition, distention of the rumen, excessive heat, or the presence of disease.

With regard to the prognosis in cases of retention of the afterbirth any evidence of septic infection must be looked upon seriously since such infection is

very difficult or impossible to check. The author criticizes unfavorably the view that retention of the afterbirth may be due to an insufficient amount of lime in the ration. It is held that a ration deficient in lime may lead to a general state of malnutrition in the animal but that in such cases the mere addition of lime to the ration will not bring about a normal parturition with the expulsion of the afterbirth within the usual period.

Hook-worm disease of cattle, A. F. Conrad and E. Barnett (*South Carolina Sta. Bul. 137, pp. 5–23, figs. 8*).—From post-mortem examinations made upon 4 heifers taken from the college herd it was found that these animals were seriously infested with the hook worm of cattle (*Monodontus phlebotomus*) previously known to occur in Texas and Florida. In two of these cases other parasites were almost entirely absent, while in two stomach worms (*Hæmonchus contortus*) were fairly numerous.

Thymol did not appear to affect the worms greatly, as in a post-mortem examination made on the third day following a dose of 150 grains, numerous stomach worms were found in the fourth stomach, myriads of hook worms in the duodenum, and many inflated bowel worms (*Œsophagostoma inflatum*) in the cecum. The results of fecal examinations, made in each animal, are given in tabular form. Life-history studies of hook worms were made and are reported.

Experiments were made to determine the extent to which the worms may be eliminated by moving 2 heifers from the infested herd to a disinfected shed known to be free from infestation. One of the animals gradually improved, while the other continued to become weaker until the condition became such that it was killed. The authors considered the principal method of host infestation to be through the mouth.

In examinations of the pasture in which the experimental herd was kept, larvæ were only found in material from the lowland and about the barn. In March the larvæ were very numerous in the bottom lands, while it was difficult to find any upon the upland. There appeared to be little development in the feces dropped on a hill during the drought of summer and little danger from infestation in running water.

At present the outlook for a cure is not encouraging. To reduce infestation, drainage, plowing, and burning are suggested. "It is recommended that on hook worm infested farms annual crop rotation be practiced as far as possible. The manure should be removed from stables occupied by infested animals daily and air-slaked lime used liberally to dry up the floors. The greatest precaution should be exercised to prevent the spread of this parasite into localities where it does not yet occur, either by shipments of infested cattle or otherwise."

Notes are also given on *Cooperia punctata* and *Œsophagostoma inflatum*.

Milk fever: Its prevention and successful treatment (*South Carolina Sta. Bul. 139, pp. 3–13 figs. 6*).—Considerable loss of cattle in the State has been due to this disease about which most cattle owners know very little. The author describes the cause of the disease, the symptoms, and methods of treatment. Attention is called to the importance of preventive treatment. The use of drugs is considered and the oxygen and sterile air treatments are described. The results obtained by the station from the use of oxygen and sterile air in 2 cases are given in tabular form. All of these recovered, with the exception of one that had been drenched, which died from gangrene of the lungs.

Notes on the cattle tick and tick fever of cattle, R. R. Dinwiddie (*Arkansas Sta. Bul. 101, pp. 185–210*).—These notes contain observations and experiments on the local life history of cattle ticks with reference to the problem of tick eradication in north Arkansas, experiments on the natural and artificial transmission of tick fever, and tests of treatment by hyperimmune serum and by in-

travenous medication. Following are some of the conclusions arrived at by the author:

"Tick infestation in the northern counties of Arkansas is due partly to yearly importation from farther south (and west in the case of Washington and Benton counties) and partly to overwintering. Larval forms (seed ticks) survived without host from October to April and probably later, but did not survive till June.

"Perpetuation of tick infestation in north Arkansas is largely due to the periods of unseasonable weather common in this region—periods of summer weather during winter season. For the purpose of tick eradication quarantine of ticky cattle should therefore be enforced in winter also.

"Adult female cattle ticks do not survive over winter in this region but may deposit eggs even in midwinter during warm spells of weather and thus perpetuate the species.

"Larval forms and ova of the cattle tick both failed to produce infection when injected subcutaneously into susceptible cattle. The blood of the adult female tick was found to be uncertain in its action but probably infectious only during the first few days after reaching maturity.

"Quinin has no specific action in this disease. Intravenous injection of Lugol's iodin solution was effective in destroying the infective property in the blood in one case but merely delayed its action in another. The maximum dose for yearlings is about 30 cc."

Tick eradication in Arkansas in 1907, W. Lenton (*Arkansas Sta. Bul. 101, pp. 211–220*).—Attention is called to the great loss due to the cattle tick and the benefits to be derived from its eradication. An act passed in May, 1907, made it possible to cooperate actively with the Bureau of Animal Industry of this Department and the work of eradication was commenced toward the end of May. The author describes in detail the methods used.

As a result of this work, on April 1, 1908, six counties were released from quarantine and admitted to the free area. State funds having become exhausted, the amount necessary to guarantee protection to the quarantine line was raised by popular subscription. At present the expense of maintaining a quarantine line in the State falls on the people of the six counties (Benton, Carrol, Clay, Randolph, Lawrence, and Green) below which the line runs. It is expected, however, that the next legislature will appropriate funds to protect the quarantine line and also for tick eradication in other counties.

The cattle tick, L. L. Lewis (*Oklahoma Sta. Circ. Inform. 11, folio*).—Attention is called to the importance of eradicating the cattle tick in Oklahoma, and an account is given of the methods by which this may be accomplished.

Cattle dipping, W. M. Power (*Natal Agr. Jour., 11 (1908), No. 3, pp. 322–324*).—Dipping is believed to be a very valuable means of ridding cattle of ticks, but, in the author's opinion, if adopted, it is necessary to have tick-free pastures on which to turn the cattle, otherwise they become reinfested and the work counts for little. The author argues against compulsory dipping laws in localities in which there are many natives who do not believe in the effectiveness of dipping.

A specific lung disease of calves, L. E. W. Bevan (*Jour. Compar. Path. and Ther., 21 (1908), No. 1, pp. 35–43*).—During the past 8 years a number of outbreaks of a lung disease have appeared in Rhodesia with a mortality of 50 per cent or greater. The most characteristic symptom of the disease is a short cough, the other symptoms being scarcely characteristic. Affected animals do not lose their appetite. The principal post-mortem lesions are found in the lungs which are studded with small nodules appearing upon the surface or in

the tissue of the lungs. In advanced cases the nodules become densely clustered together.

The symptoms and post-mortem lesions are carefully outlined for the purpose of assisting in a differential diagnosis between the disease and white scour, pleuro-pneumonia, and other diseases with similar symptoms. The disease in question appears to be able to remain in a latent condition in the animals and breaks out in acute form when, for any reason, the resisting power of the animal is lowered. Treatment of the disease is for the most part without avail.

Scab: Its nature, cause, symptoms, and treatment, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 32 (1908), No. 4, pp. 433–448, figs. 11*).—The symptoms of scab in various animals are outlined and notes are given on the different species of mites which cause scabies of different sorts, together with a brief discussion of the complaints which have been raised by wool dealers as to the injury caused to wool by the use of certain dips. Wool dealers are by no means of the same opinion on this point.

The author considers that in the treatment of scab no other remedy can compete with a mixture containing sulphur, and recommends a lime-sulphur dip containing 25 lbs. of sulphur and 18 lbs. of lime in 100 gal. of water. A formula is also given for the preparation of a sulphur and caustic soda dip for sheep and goats.

Anemia and pasteurelloses, J. LIGNIÈRES (*Bul. Soc. Cent. Méd. Vét., 85 (1908), No. 8, pp. 187–190*).—Since evidence has been furnished that hog cholera may be produced by a filterable virus independently of the so-called hog cholera bacillus it has been suggested that perhaps other bacteria which have been referred to the pasteurella group may be of secondary pathogenic importance. The author combats this theory and argues that the hog-cholera bacillus differs in many respects from the other members of the pasteurella group.

Swine erysipelas, H. HOLTH (*Norsk Vet. Tidsskr., 20 (1908), No. 5, pp. 113–126*).—The present status of swine erysipelas in various European countries is outlined and statistical data are given regarding the prevalence of the disease and the percentage of mortality. In localities where preventive vaccination has been thoroughly applied the prevalence of swine erysipelas has been greatly reduced.

The occurrence of the bacilli of swine erysipelas in the gall bladder of hogs which have recovered from the disease, W. PITT (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), No. 5, pp. 400–405*).—From the observations and experiments thus far made it appears that the bacilli of swine erysipelas persist longest in the gall bladder of recovered animals and may be found in that organ after they have disappeared from all other parts of the body. The bacilli may be found in recovered hogs after attacks from mild or acute cases of the disease. The bacilli found in the gall bladder are viable and virulent.

A germ-free extract for the prevention of swine plague, PFEIL (*Berlin. Tierärztl. Wchnschr., 1908, No. 17, pp. 301, 302*).—On an estate badly infected with swine plague the author inoculated 45 hogs with a mixture of polyvalent swine-plague serum and a germ-free extract of the bacillus of swine plague. All of these animals were immunized by this treatment and remained healthy, while check animals living under the same conditions became infected in a large percentage of cases.

The poisoning of hogs by kitchen swill, H. FRESENIUS (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 457–461*).—An account is given of an outbreak of poisoning among a herd of hogs fed on the swill from the kitchen.

Chemical examination of the stomach contents in one case indicated the presence of traces of mercury, copper, and lead. Attention is called to the fact that

acid food materials preserved in tin utensils or other receptacles soldered with lead preparation may ultimately dissolve and contain some lead. In the case under discussion, however, it was not certain that the poisonous effects were not partly due to ptomaine poisoning since there was a large amount of fragments of lobster, crabs, oysters, and fish in the swill.

The horse: Ailments and accidents, F. T. BARTON (*Philadelphia, Pa., 1908, pp. 192*).—The purpose of this volume is to supply the amateur horse raiser with information regarding the common ailments and accidents which affect the horse and to indicate the symptoms and nature of serious diseases which require the service of a trained veterinarian.

Cutaneous and conjunctival reaction in glanders, DIETRICH (*Arch. Wiss. u. Prakt. Tierheilk., 34 (1908), No. 3, pp. 246–257*).—Neither the cutaneous nor conjunctival method of applying mallein gave the correct indication in the case of 10 glanderous and 6 healthy guinea pigs. With glanderous horses the conjunctival reaction was positive in only 46 per cent and the cutaneous reaction was negative in every instance. Neither of these methods of applying mallein is considered reliable.

Mallein reaction, MIESSNER (*Arch. Wiss. u. Prakt. Tierheilk., 34 (1908), No. 3, pp. 233–245*).—In experiments carried on by the author it was found that in certain cases healthy horses react to mallein and that sometimes glanderous horses do not react. Mallein is, therefore, considered an unreliable diagnostic reagent. A reaction is considered reliable if the elevation of temperature is 2° C. or more and if other local and general symptoms of reaction appear. An injection of mallein into a healthy horse has no effect upon a subsequent injection, but in case of diseased horses it reduces the intensity of the second reaction.

Intratracheal injection of iodin for joint-ill in foals, W. LOTHIAN (*Vet. Rec., 20 (1908), No. 1034, pp. 777, 778*).—Very satisfactory results are reported in treating joint-ill in foals by intratracheal injection of 3 drams of a solution containing 2½ grains of iodin and 5 grains of iodid of potash to the ounce of water. The injection is repeated daily for 2 or 3 days and then every other day until decided improvement is manifest. As a rule, 5 or 6 injections are sufficient.

A preliminary report on the so-called cerebro-spinal meningitis of horses, H. J. MILKS (*Louisiana Stas. Bul. 106, pp. 3–17, pls. 4*).—This disease was prevalent in certain parts of the State during the fall of 1906 and the summer of 1907. It was not confined to any particular locality, occurring in lowlands and in the hill and bluff districts. Animals of all ages were attacked and horses apparently more than mules, and cases appearing in rather widely separated localities. An account is given of the symptoms and post-mortem appearance. Inoculations of rabbits, guinea pigs, and of a horse were made, but none of the animals showed any effect therefrom. The cause of the disease or of its infective nature was not determined by the investigations. No microorganism was encountered that would account for the disease. It is stated that if the statements made by different owners regarding materials consumed by different animals be accepted as accurate, the theory of food contamination does not seem well founded. However, until the exact nature of the agent producing the disease, as well as a possible remedy, has been discovered, it is recommended that upon first symptoms the feeding materials be changed. References to literature are given.

A new method of vaccination against strangles, L. BARUCHELLO (*Rev. Gén. Méd. Vét., 11 (1908), No. 129, pp. 497–509*).—The methods which have been commonly used in vaccinating horses against strangles are critically reviewed by the author.

An essentially new method of vaccination is proposed which consists in using the pleural exudate of rabbits and guinea pigs killed by inoculation with the streptococcus of strangles. The pleural exudate thus obtained is employed in a hyper-immunizing process, the exudate being used first only after sterilization and filtration and later without sterilization. Horses thus treated require a high degree of immunity and furnish a vaccine which has given good results in the several hundred cases in which it has been tried.

Statistical data on dog distemper, D. Wirth (*Tierärztl. Zentbl., 31 (1908), No. 13, pp. 200–205*).—Opportunity was had to make numerous observations on dog distemper at the veterinary high school in Vienna. The data thus collected are presented in tabular form. It appears that the disease is not influenced by the race of dog. Female dogs show a tendency to develop the nervous form of the disease in a higher percentage than do male dogs. The mortality was no higher in pups than in adult dogs.

Report of the veterinarian, J. B. Paige (*Massachusetts Sta. Rpt. 1907, pp. 156–163*).—European fowl cholera of a mild type broke out on two farms in one locality during the year. In one case the disease was stamped out by destroying the flock, thoroughly cleansing the houses, and using disinfectants. In the other case, cleaning the houses and the use of disinfectants appear to have been efficient. While the source of contamination could not be determined, the disease is supposed to have been introduced through fowls purchased from traveling dealers in live poultry.

A disease broke out in brooder chicks in one locality on Cape Cod, in which the mortality ranged from 90 to 100 per cent, but never made its appearance among adult fowls or young chickens aside from those brooded in brooders. Numerous remedies employed proved of no avail and analysis of the soil for suspected irritating poisonous substances yielded negative results, but in experiments made upon chicks by concentrating the sun's rays upon the legs and feet by a lens, lesions were produced identical with those on brooder chicks. The removal of all chicks to a location with vegetation sufficient to protect the featherless and tender portions of the body from the heat of the sun, as recommended, has apparently prevented the trouble.

Fatal septicemia in young chickens or white diarrhea, L. F. Rettger and S. C. Harvey (*Jour. Med. Research, 18 (1908), No. 2, pp. 277–290*).—The disease commonly known as white diarrhea has been confused with fowl cholera and also with ordinary diarrhea which may be due to changes of climate and improper rations. The virulent form of white diarrhea, however, according to the investigations of the authors, is due to a bacillus which is closely related to the coli bacillus, hog-cholera bacillus, and typhoid bacillus. The behavior of the micro-organism on various nutrient media is described. When an infection has once become established it appears to be a difficult matter to eradicate it, and it is likely to appear on the same premises for 2 or 3 years in succession. There appears to be no cure for the disease, but a spread of infection may be largely checked by thorough cleansing and disinfection of incubators, brooders, and inclosures in which chicks are kept.

Spirochetosis of fowls in southern Rhodesia, L. E. W. Bevan (*Jour. Compar. Path. and Ther., 21 (1908), No. 1, pp. 43–49, figs. 2*).—The literature relating to this disease is briefly reviewed.

As a rule, fowls affected with spirochetosis die within a few hours. They suffer from thirst and pronounced weakness from the time of appearance of the first symptoms. The chief post-mortem lesion is anemia. Apparently the disease is associated with *Argas persicus*, which may be instrumental in transmitting it. In preventing infestation of the premises with this tick it is recommended that adult fowls be inspected and quarantined before admitting them to

the premises and that all infested coops or crates be thoroughly treated with a suitable insecticide. Somewhat encouraging results were obtained in treating affected fowls with atoxyl and quinin.

RURAL ENGINEERING.

Practical irrigation; its value and cost. A. J. Bowie, Jr., (*New York, 1908, pp. VIII+232, figs. 53*).—This book deals with certain phases of the subject of water supply for irrigation rather than with the use of water in irrigation, and the greater part of it is devoted to wells, pumps and pumping machinery, and storage reservoirs.

About one-third of the space is given to artificial reservoirs made entirely in embankments. Such reservoirs are not in general use, but in the author's opinion there is a large field for their use in storing water where natural reservoir sites are not available. Formulas, curves and tables for computing water holding capacity, cubic contents of embankments, and cost are given.

In addition to the subjects treated at length, mentioned above, there are brief discussions of methods of irrigation, evaporation, flow of water in ditches, methods of charging for water, and irrigation near Bakersfield, Cal. In general, the book consists of miscellaneous observations on the subjects discussed. The treatment of all subjects is mathematical, the book containing many hydraulic formulas and tables.

Reports upon the administration of the irrigation services in Egypt and in the Sudan for the year 1906 (*Cairo: Govt., 1907, pp. 58, pls. 4, dgms. 2, charts 2*).—This report consists of a general report by Sir William Garstin, adviser to the ministry of public works, and detailed administrative reports by A. L. Webb, under secretary of state for irrigation in Egypt, and C. E. Dupuis, inspector-general of irrigation in the Sudan.

The report shows large increases in the area devoted to cotton and the statement is made that this increase will continue so long as the present prices of cotton are maintained. This increase is made possible by the change from the basin system to perennial irrigation depending upon the Assuan dam. It is now estimated that the conversion works in Middle Egypt will, when completed, provide perennial irrigation for about 420,000 acres, formerly included in basins, at a total cost of about $21,000,000, or approximately $50 per acre. On the basis of work so far done this will increase the rental value of the lands about $21 per acre and the selling value about $275 per acre. The author states that while these figures may seem large they are in no way exaggerated.

It has been found that the floods discharged by the Assuan dam have eroded the channel below the dam, the pits in some cases going below the foundation of the dam and rendering it unsafe. This damage has been repaired by blasting out the rotten rock, filling the holes with masonry, and constructing an apron below the dam which modifies the discharge of the water from the sluice in such a way that no erosion takes place. It is considered that since these repairs there is no danger to the dam from this source.

The work done in the Sudan consisted entirely of surveys preliminary to the making of plans for the improvement of the headwaters of the Nile. The object to be attained is the prevention of losses into the marshes during low water without destroying their usefulness as an escape for flood water. The surveys have not proceeded far enough to allow the formulation of any definite plans for accomplishing this.

Experiments in irrigation, Gerlach and Krüger (*Arb. Deut. Landw. Gesell., 1908, No. 141, pp. 52, pls. 8, figs. 2*).—This is an account of experiments carried on at the Kaiser Wilhelm Institute at Bromberg during the dry year of 1906

and the wet year of 1907 on fertilized and unfertilized plats of corn, oats, beets, and carrots, using 5.9 in. and 11.8 in. of water. Irrigation was decidedly beneficial in the dry year and the beneficial effect was increased by the addition of fertilizers, but in the wet year irrigation not only was not beneficial but even resulted in a decreased yield, due, it is thought, to a leaching out of the fertilizing matter from the soil.

Measurement of water, E. T. TANNATT and R. D. KNEALE (*Montana Sta. Bul. 72, pp. 3–40, pls. 7, figs. 7*).—This is a revision and extension of Bulletin 34 of the station (E. S. R., 14, p. 94), describing the various units employed in measurements of water, and the construction and proper use of weirs and flumes, and also including tables for calculating the discharge over weirs. The use of the second-foot is strongly advised in order to avoid misunderstandings. Common errors made in measuring devices and reasons for failure are pointed out in the text and illustrated by photographs of weirs actually constructed. Mention is made of an automatic measuring instrument patented by E. B. Howell for accurately measuring the depth of water on a weir.

Preliminary tests of sugarhouse machinery, E. W. KERR (*Louisiana Stas. Bul. 107, pp. 3–16, figs. 6*).—This contains results of preliminary tests made to get information as to the relation of capacity to energy consumed and as to the efficiency of machinery peculiar to sugarhouses.

The methods of testing sugar-mill work are discussed. That of determining the volume of juice in the bagasse per unit weight of fiber in the bagasse is deemed impracticable because of difficulty in determining the density of the juice. The method of using percentage of weight of moisture in the bagasse is considered accurate enough for practical purposes.

Tests were made on a mill of the 6-roller type in which the mill rolls were 34 by 84 in., and there was a pressure of 330 tons on the front mill and 390 tons on the back mill supplied by the hydraulics. The indicated horsepower of the engine, when operating the mill, is compared with its rated capacity and also with its indicated horsepower when under no load. The friction of the mill as thus determined shows a probable loss of but 5 per cent in mill friction.

Tests were also made of a cane carrier operated by direct current electric motor. The carrier was 600 ft. long, the vertical lift 27 ft., and the cane was being carried at the rate of 49.26 tons per hour during the tests. The horsepower figured from measurements by voltameter and ammeter, compared with the useful work done, shows an efficiency of 13.7 per cent, 86.3 per cent being lost in friction.

A set of four 30 in. centrifugals of '97 model of Weston type, used for drying second sugars, and a set of five 40 in. Weston centrifugals, used for drying first sugars, were tested to determine the power required both for starting and running. Power for the 30 in. centrifugals was supplied by direct current electric motor and for the 40 in. by an automatic high-speed engine. The starting power of the motor was measured by noting the maximum ammeter reading, and the running power by the reading when the needle came to rest. The results show that the running power is about 25 per cent of the starting power. The power required to start indicates the capacity of the source of power, but not the energy necessary to be supplied by the boiler in the case of a steam engine.

It was attempted to measure the horsepower of the engine by means of a steam-engine indicator and a speed indicator, but this method proved unsatisfactory because of irregularities "due to the fact that the speed counter could not be depended upon to indicate accurately the speed at the moment of starting. A tachometer will be procured for future use."

Applications of electricity to agriculture, D. Hermenegildo Gorria (*Mem. R. Acad. Cien. y Artes Barcelona, 3. ser., 6 (1908), No. 33, pp. 57*).—This article discusses at some length the utilization of natural supplies of power in the production of electricity and the applications of electricity in electro-culture, in the destruction of insects, in assisting the germination of seed and the fixation of nitrogen in soils and plants, the production of nitrogenous fertilizers by means of electricity, and the use of electricity in various farm operations—heat, light, power, and communication. It is shown that there are a great many useful applications of electricity in agriculture which might be profitably employed through cooperation or associations of farmers, if not by the individual farmer.

The equipment of farms and country houses with electricity, P. A. Bates (*Jour. Franklin Inst., 166 (1908), No. 1, pp. 47–49, figs. 45*).—This article discusses various kinds of machinery and appliances used in the equipment of farms and country houses with electricity.

RURAL ECONOMICS.

The mistakes of farm management as determined by bookkeeping (*Landw. Ztschr. Rheinprovinz, 9 (1908), No. 26, pp. 354, 355*).—The net returns of 8 farms differently managed as to the extent of field culture, number of live stock, fertilizers purchased, etc., show a range from a loss of 0.18 mark to a gain of 30.7 marks per hectare, as compared with the average net returns of 57 well-managed farms of 48.9 marks per hectare. The management of each of the 8 farms is described.

Piecework in agriculture, Stieger (*Mitt. Deut. Landw. Gesell., 23 (1908), No. 29, pp. 241–250; Bl. Zuckerrübenbau, 15 (1908), Nos. 14, pp. 213–222; 15, pp. 235–243*).—The author discusses the influence of piecework on the agricultural labor problem in Germany, with particular reference to the benefits accruing both to the farmer and to the laborer from this form of agreement.

Piecework in the place of a day wage is advocated as a means of counteracting the effects of rural depopulation by accomplishing a greater amount of work with a given number of laborers. The benefit to the farmer of piecework lies in hastening the work of the farm and relieving him of overseeing to a great extent; the benefit to the laborer lies in his greater independence, larger income, and development of character.

What influence has piecework upon the agricultural labor problem and how can its most important features be carried out? T. Römer (*Illus. Landw. Ztg., 28 (1908), No. 76, pp. 651–661, figs. 5*).—The author discusses the reasons for introducing piecework into agriculture, the terms of agreement, the greater amount of work accomplished by this form of employment, the practicability of piecework in the agricultural industry, its effects upon the worker, and the general results. The author concludes that "piecework in agriculture operates very favorably upon the labor situation, being advantageous to both the laborer and the employing farmer; that, on account of his greater income, it raises the economic condition of the farm laborer and improves his character; and that these results are undoubtedly to be credited to the operation of piecework."

The Belgian migratory laborer, F. Ryziger (*Ann. Gembloux, 18 (1908), No. 8, pp. 470–478*).—This is a critical dissertation on a work by J. Frost entitled Belgische Wanderarbeiter. The author sets forth certain facts regarding the farm laborer's mode of life, the causes of emigration, number of farm laborers migrating to Holland, France, and Germany, the wages paid in the different countries as compared with the wages paid in Belgium, and the kind and length of service. Suggestions are made looking to the economic and social improvement of this class of laborers.

The second congress of mutual credit and agricultural cooperative societies, F. Lesourd (*Jour. Agr. Prat., n. scr., 16 (1908), No. 28, pp. 51–54*).—A summarized account of the topics discussed at the meetings of this congress. These topics related in general to the limitations of mutual agricultural credit banks, the utilization of agricultural credit in relation to forest conservation, agricultural credit in nature, credit based on word of honor, security for the future of mutual agricultural credit, agricultural insurance in relation to mutual credit, etc.

Mutual agricultural insurance societies in 1908 (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), Nos. 8, pp. 953–964; 9, pp. 1087–1098; Rev. Vit., 30 (1908), No. 763, pp. 128, 129; Semaine Agr. [Paris], 27 (1908), No. 1419, p. 242; Jour. Agr. Prat., n. scr., 16 (1908), No. 31, pp. 133, 134*).—The number of societies in France was 8,780 in June, 1908. Of this number there were 7,241 societies insuring live stock with 53 banks, 1,442 against fire with 16 banks, and 24 against hail. The live stock insurance societies had 398,375 members and the cattle insured were worth 429,209,667 francs. The fire insurance societies had 31,964 members with property insured valued at 277,556,706 francs.

Annual report on the working of cooperative societies in the Punjab for the fifteen months ending June 30, 1907, S. Wilberforce (*Ann. Rpt. Work. Coop. Soc. Punjab, 1907, pp. 24+VII*).—Detailed statistics of number of cooperative credit societies, memberships, receipts, disbursements, loans, etc., are presented and discussed. At the close of the period the societies numbered 174 as compared with 28 at the beginning, the corresponding figures of membership being 17,254 and 1,525, respectively. The financial standing of the societies was equally flourishing.

International agricultural institute, L. C. Griscom (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3252, pp. 6, 7*).—A brief report is given of the first session of the permanent committee of the International Institute of Agriculture held at Rome from May 23 to June 6, 1908. The general desire was to create an international statistical bureau for the compilation of the world's agricultural products. The permanent committee was to meet again on November 10 and the general assembly on November 20.

The modern state and agriculture, A. Gomes Carmo (*O Estado Moderno e a Agricultura. Rio de Janeiro: Govt., 1908, pp. LXXXV+419, pls. 4, figs. 62*).—This volume presents statistics and other data relating to the development, condition, and government aid of agriculture in the United States, Canada, Mexico, Argentina, Switzerland, France, Belgium, Portugal, Denmark, and some of the British colonies, with lists of the publications consulted in the compilation of the work.

America's amazing agricultural advance (*Manfrs.' Rec., 54 (1908), No. 5, pp. 41, 42*).—Statistics of agricultural wealth production, value of farm property, and of population engaged in agriculture during the years 1870 to 1908, inclusive, are presented and discussed in this article.

The increase in value of farm products is shown by the statement that "in the 20-year period between 1870 and 1890 the gain was only $500,000,000; in the 30-year period between 1870 and 1900 the gain was only $2,800,000,000; whereas in the 8-year period from 1900 to 1908 the gain was $3,300,000,000, or $500,000,000 more than for the 30 years from 1870 to 1900." In 1907 the value of farm products raised was $7,412,000,000, the value of all farm property $28,077,000,000, and the number of people engaged in or dependent on agriculture 11,991,000. The great increase in wealth production is attributed to the rapid growth in scientific farming.

The American farmer feeding the world, W. M. Hays (*World's Work, 16 (1908), No. 4, pp. 10597–10603, figs. 27*).—Statistics of the quantity, value, and

destination of the exports of the main agricultural products are discussed and diagrammatically illustrated in this article.

The author calls attention to the fact that the grains and oil cakes exported contain large quantities of nitrogen, phosphoric acid, and potash and could be more profitably utilized on the farms in the United States by being fed to live stock, etc. In this way there would be returned "to our own soils the tens of millions of dollars' worth of fertilizer ingredients and in addition several million tons of humus-making substances other than nitrogen, phosphoric acid, and potash. We would induce the change of the crops of more of our farm areas to grasses and annual forage crops, which both rest the soil and add to it organic matter which adds greatly to the profits from crops."

Settlement and agricultural development of the northwest provinces of Canada, E. H. Godfrey (*Jour. Roy. Statis. Soc., 71 (1908), No. 2, pp. 397–404*).—The information contained in this article is largely summarized from a publication previously noted (E. S. R., 19, p. 1191).

Agriculture in Denmark, Tisserand (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 6, pp. 376–414; Jour. Soc. Statis. Paris, 49 (1908), Nos. 8, pp. 264–275; 9, pp. 296–308*).—This is a general review of the progress made in all branches of agriculture in Denmark from 1855 to 1907, including data on agricultural production, conditions of farm labor, size of farms, etc. The chief causes of progress are given as scientific investigations and government aid, the chief directions in which these forces have operated being pointed out. Data are also presented and discussed relating to agricultural organizations and cooperative societies.

Notes on agriculture in South Australia, W. L. Summers (*Adelaide: Govt., 1908, pp. 61, figs. 55*).—This brochure gives information concerning agricultural conditions and opportunities in South Australia and is finely illustrated with scenes typical of the agriculture in different sections of the country.

[Agricultural statistics of Australia], G. H. Knibbs (*Off. Yearbook Aust., 1908, pp. 219–385, dgms. 7*).—These chapters, dealing respectively with land tenure and settlement, pastoral production, agricultural production, farmyard and dairy production, and forests, forestry, and forestal products of Australia, give statistical information with discussion relating to these topics from 1787 to 1906, inclusive. They comprise a historical sketch of agricultural development in Australia for more than a century.

Agriculture in Japan, H. Sharp (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3255, pp. 9–12*).—A brief account is given of agricultural conditions in Japan, including notes on land areas, implements used, extent of fertilizer importation, irrigation practices, and agricultural exports and imports for 1906 and preceding years.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 10, pp. 73–80*).—The condition of crops in the United States and foreign countries, data on the farm values of principal crops and range of prices of agricultural products in the United States, and a summary of the crop acreage and live stock in the United Kingdom are reported to October 1, 1908.

AGRICULTURAL EDUCATION.

Agriculture the basis of education, O. F. Cook (*Reprint from Monist, July, 1907, pp. 347–364*).—In this paper the author develops his thesis on the long recognized fact that agriculture furnishes the material basis for civilization, and proceeds to show that while this fact has been recognized, educators seem to have forgotten that agriculture is just as truly the basis of intellectual and social development. He believes that "the mental conditions of agriculture

are just as essential to the normal development of the human mind as air, food, and exercise for the development of the body," and that "by no system or method of formal education can children confined to city houses, doorsteps, paved streets, and schools be brought to their full mental stature."

The mission of the Christian college, E. E. Reed (*Lenox Col. Bul., 4 (1907), No. 10, pp. 22*).—This is the inaugural address of Pres. E. E. Reed, of Lenox College, Hopkinton, Iowa, and consists largely of an argument in favor of teaching agriculture in denominational colleges, especially in the 3 years preparatory to the college course.

Development of agricultural education, E. E. Brown (*Jour. Ed. [Boston], 67 (1908), No. 24, pp. 648–650*).—A brief account of the development of agricultural education in the United States.

The agricultural college and its relationship to the scheme of national education, E. J. Wickson (*Addresses and Proc. Nat. Ed. Assoc., 45 (1907), pp. 1041–1048*).—Previously noted as Circular 31 of the California Station (E. S. R. 19, p. 993).

What has been done by normal schools and agricultural colleges for popular education in agriculture, E. E. Balcomb (*Addresses and Proc. Nat. Ed. Assoc., 45 (1907), pp. 1069–1075*).—This paper, presented at the 1907 convention of the National Education Association, is a compilation of information secured by correspondence from the different State normal schools and agricultural colleges concerning their efforts to extend popular education in agriculture.

Agriculture in normal schools: Courses of instruction and financial support, E. E. Balcomb (*Addresses and Proc. Nat. Ed. Assoc., 45 (1907), pp. 752–758*).—A paper presented at the 1907 convention of the National Education Association.

On the training of persons to teach agriculture in the public schools, L. H. Bailey (*Bur. of Ed. [U. S.] Bul. 1, 1908, pp. 53*).—This paper was prepared at the request of the United States Commissioner of Education and is divided into three parts: (1) The nature of the problem, which contains a discussion of the problems of the elementary schools, high schools, and special schools of agriculture; (2) the means of training the teachers, among which are aids to teachers, such as summer schools, regular teachers' institutes, lectures, correspondence and leaflet work, short courses in agricultural colleges, peripatetic teachers, and the educational work of this Department, and courses for the training of new teachers in normal schools, training classes, separate agricultural schools, special foundations, education departments and teachers' colleges, and colleges of agriculture, and (3) the general outlook and the significance of normal work in the colleges of agriculture, in which the writer includes information on some of the work now undertaken for the training of teachers in some of the agricultural colleges.

The work of the National Government in extending agricultural education through the public schools, D. J. Crosby (*Addresses and Proc. Nat. Ed. Assoc., 45 (1907), pp. 1063–1069*).—This is a paper presented at the 1907 convention of the National Education Association, in which the discussion is limited to two main considerations: (1) Financial aid from the Federal Government, and (2) expert assistance from Federal Executive Departments.

Report of the committee on industrial education in schools for rural communities (*Addresses and Proc. Nat. Ed. Assoc., 45 (1907), pp. 409–446*).—This report, which was submitted at the 1907 convention of the National Education Association, is the second report of this committee and supplements that submitted at the 1905 meeting (E. S. R., 17, p. 196). The report was written by L. H. Bailey, and includes (1) a discussion of the general problem of the

rural school and the importance of articulating it with the activities of life, description of new types of rural school buildings, discussion of school gardens, manual training, and separate agricultural schools, mention of agencies which contribute to the nationalizing of the work, and the author's opinion concerning the kinds of schools in which agriculture may be taught; (2) data concerning the present status of industrial work in rural schools in New England, New Jersey, Pennsylvania, and New York; (3) experiences and opinions of individual teachers in the territory mentioned; and (4) a discussion by the author on the preparation of teachers for industrial schools in rural communities.

Agricultural instruction for soldiers. F. MAIER-BODE (*Fühlings Landw. Ztg., 57 (1908), No. 6, pp. 201–210*).—An account is presented of the first course of instruction in agriculture given to subalterns and privates in the German army at Augsburg, beginning January 15, 1907, and extending over 20 days. Instruction was given on the origin, formation, and management of soils, the composition and use of manures and fertilizers, plant life, farm crops, diseases and insect pests of plants, grasses and forage crops, care of the orchard, animal husbandry and nutrition, milk and its utilization, farm management, and farm accounts. The work of the first course was attended with such success that courses have since been given in 14 other places with a total attendance of 2,970.

School gardens. J. VERCIER (*Jour. Soc. Nat. Hort. France, 4. ser., 9 (1908), April, pp. 243–261, dgm. 1*).—This article contains brief statements regarding the condition of agricultural instruction in the primary and normal schools of France and the part taken by the teacher, the need of developing a taste for agriculture in the child and the methods employed in accomplishing it, the necessity of introducing practical work in the present agricultural instruction in the primary school, school gardens in Cote-d'Or, an outline plan for a garden, a school nursery, results obtained during 8 years' experience, and suggestions for the future development of the work.

Farm bacteriology. W. C. PALMER (*Winona Lake, Ind., 1908, pp. 18*).—This deals with bacteria in their relation to the decay of organic matter, nitrogen in soils, changes in milk, cream, butter, and cheese, preservation of food, and diseases of animals. There is also a brief discussion of disinfection and disinfectants.

Hints for eastern Oregon farmers. J. WITHYCOMBE ET AL. (*Oregon Sta. Circ. Bul. 2, pp. 24*).—A circular of information concerning agronomy, horticulture, chemistry, and animal husbandry prepared for distribution among farmers attending meetings on a farming demonstration train.

MISCELLANEOUS.

Twentieth Annual Report of Massachusetts Station, 1907 (*Massachusetts Sta. Rpt. 1907, pp. 172*).—This contains the organization list of the station, a report of the director, which includes lists of the publications during 1907, and of the bulletins and reports available for distribution, a financial statement for the fiscal year ended June 30, 1907, a report of the meteorologist, and other departmental reports, parts of which are abstracted elsewhere in this issue.

Annual Report of Pennsylvania Station, 1907 (*Pennsylvania Sta. Rpt. 1907, pp. III+236*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1907, a report of the director on the work of the station during the year, together with a synopsis of its work

since 1887, and other departmental reports, of which that of the meteorologist is abstracted elsewhere in this issue. The report also contains reprints of Bulletins 82, 83, and 85 previously noted and of an article on The Available Energy of Red Clover Hay (E. S. R., 19, p. 866), and articles reporting A Test of Soiling Crops for Dairy Cows, and on Small Fruits in 1906, abstracted elsewhere in this issue. An appendix to the report of the librarian presents a check list of the official publications of the Pennsylvania State College.

Nineteenth Annual Report of Tennessee Station, 1906 (*Tennessee Sta. Rpt. 1906, pp. 91–108, figs. 2*).—This contains the organization list, reports of the director and members of the station staff, and a financial statement for the fiscal year ended June 30, 1906.

Seventeenth Annual Report of Utah Station, 1906 (*Utah Sta. Rpt. 1906, pp. XLIX*).—This includes the organization list, reports of the director and heads of departments, reviews of the publications issued during the year, a list of bulletins and circulars issued up to January, 1907, and a financial statement for the fiscal year ended June 30, 1906.

Twentieth Annual Report of Vermont Station, 1907 (*Vermont Sta. Rpt. 1907, pp. 299–518*).—This contains the organization list, a brief announcement concerning the station, a financial statement for the fiscal year ended June 30, 1907, a report of the director containing a list of publications of the station available for distribution, abstracts of Bulletins 124–130 of the station issued during the year, results of miscellaneous analyses, a report on the Vermont State nursery for forest tree seedlings, and numerous other articles abstracted elsewhere in this issue. A special feature is the presentation of condensed outlines, arranged by subjects, of articles published in Annual Reports 1–19 and Bulletins 1–133, comprising the publications of the station from its establishment in 1887 to 1907.

Abstract Twentieth Report, 1906–7 (*Vermont Sta. Buls. 136, pp. 187–222; 137, pp. 227–264*).—These bulletins give a brief résumé of the annual report of the station noted above. Bulletin 136 includes plant diseases, horticulture, weeds, and insects, and Bulletin 137 crops, forestry, stock feeding, and dairy husbandry.

Thirteenth Annual Report of Washington Station, 1903 (*Washington Sta. Rpt. 1903, pp. 28*).—This includes the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1903.

Fourteenth Annual Report of Washington Station, 1904 (*Washington Sta. Rpt. 1904, pp. 20*).—Data similar to the above are given for the fiscal year ended June 30, 1904.

Fifteenth Annual Report of Washington Station, 1905 (*Washington Sta. Rpt. 1905, pp. 31*).—Data similar to the above are given for the fiscal year ended June 30, 1905. The report of the veterinarian is abstracted on page 379 of this issue.

[Index to Volume IV of Arizona Station publications], W. O. Hayes (*Arizona Sta. [Index] Bul. 1902–1905, pp. 557–590*).—An index to Bulletins 41–51 and the Annual Reports from 1902–1904.

Experiment Station Work, XLVII (*U. S. Dept. Agr., Farmers' Bul. 329, pp. 32, figs. 4*).—This number contains articles on the following subjects: Low-grade *v.* high-grade fertilizers, improvement of sandy soils, dry farming, seed selection, evergreens—uses and culture, nut growing in Maryland, "hogging off" corn, mineral matter in feeding stuffs, preparation of miscible oils, an automatic cheese press, and cane sugar and beet sugar.

NOTES.

Hawaii Station.—The station has planned a set of breeding experiments with Sea Island, Caravonica and Egyptian cottons covering 5 acres of land and a fertilizer experiment covering 10 acres. As a result of experiments already under way a marked revival in interest in cotton growing is reported, and it is expected that within the near future about 10,000 acres will be planted. Requests have been made for the selected Sea Island and Caravonica seed greatly in excess of the station supply. The climatic and other conditions of the islands appear to be very favorable for the growth of cotton of a high grade.

Kansas College and Station.—E. H. Webster, Chief of the Dairy Division of this Department, has accepted the position of dean of agriculture in the college and director of the station to take effect January 1, 1909.

New Hampshire Station.—The station has adopted the plan of reprinting the scientific articles based on work done at the station and contributed by members of its staff to periodicals, as a numbered series to be known as Scientific Contributions of the New Hampshire Agricultural Experiment Station. The series is to be sent to the libraries of the agricultural colleges and experiment stations, and to this Department, but is not to be available for general distribution. Scientific Contributions Nos. 1 and 2, already issued, contain, respectively, reprints of The Influence of Minimum Temperatures in Limiting the Northern Distribution of Insects, from the *Journal of Economic Entomology*, and The Fruit Spot of Apples, from the *Bulletin of the Torrey Botanical Club*.

Nebraska University and Station.—W. H. Hein has resigned as adjunct professor of agricultural botany and assistant botanist and has been succeeded as adjunct professor by R. E. Stone of the Alabama College. M. H. Swenk, whose appointment as assistant entomologist in the station has been previously noted, has also been appointed adjunct professor of entomology. Robert F. Howard has been appointed assistant horticulturist in the station, beginning December 10.

Wisconsin University.—The first sessions of a bakers' institute organized by the university extension department were held in Milwaukee, October 26–28, and were attended by about 170 bakers. The course included lectures by professors in the university, specialists of this Department, and others, concerning raw materials and products used by bakers, bacteria and yeasts, methods of baking, food values, bakeshop hygiene and sanitation, and other related subjects.

Association of Official Agricultural Chemists.—This association held its twenty-fifth annual convention in Washington, D. C., November 12–16, 1908. Over 200 delegates and visitors were in attendance, the largest in its history, the number being considerably augmented by the meetings of other agricultural organizations in the city. On invitation of the association a brief address was given by Secretary Wilson of this Department in which he directed attention to the questions of soil improvement and pure foods, and to the opportunity open to the association in these lines. During the sessions opportunity was afforded for an inspection of the workings of the denatured alcohol plant of the Bureau of Chemistry.

The address of the president, Prof. Harry Snyder of the Minnesota University and Station, was entitled The Training of the Agricultural Chemist. In this address was emphasized the necessity for the maintenance of high ideals to be developed by a special technical training in agricultural chemistry, coupled with a broad equipment in other lines so that the worker may "outline an investigation, plan intricate details, carry the work to a satisfactory conclusion, and correctly interpret the results." The speaker advocated the establishment in some of our institutions of courses of study having for their specific object the training of agricultural chemists, these courses to present a correlation of the different sciences blended with general and technical chemistry. The development of correct methods was regarded as fundamental, though not always fully appreciated in the desire for immediate results. A knowledge of technical processes of manufacture was deemed essential in the inspection of agricultural products. The position of the agricultural chemist was regarded as in a transition stage, but with the tendency toward larger opportunities, better compensation, and greater recognition, although research work was still handicapped by inadequate preparation and lack of equipment and intelligent support. The field of the association was also discussed, its special province being considered the study and perfection of methods of analysis.

The initial day of the convention was, as usual, devoted largely to papers on food adulteration. A general report was submitted by H. E. Barnard, referee, together with more detailed reports by the associate referees. J. Hortvet, associate referee on wine, discussed the determination of volatile and fixed acids and reducing sugars, and called attention to the necessity of a special study of the determination of glycerol and the examination of the natural coloring matter in wines. H. E. Barnard reported on beer analysis a necessity for the refinement of the present analytical methods and additional differentiation of the various types of beer. Considerable progress was reported in the study of methods for brewing materials, especially on the determination of fat and gluten. L. M. Tolman, associate referee on distilled liquors, presented modifications of the Allen-Marquardt method for fusel oil.

The associate referee on vinegar, C. H. Hickey, presented a study of the lead number for pure cider vinegar. E. M. Chace, associate referee on flavoring extracts, reported that highly satisfactory results had been obtained by collaborators using the provisional methods, except with that for citral, which needs further study. The work with spices, reported by A. L. Winton, was restricted to a study of the adulteration of paprika with olive oil and its detection. The report of H. M. Loomis, associate referee on colors, indicated that the vegetable coloring matters are not sufficiently well understood and the methods of identification inadequate, and that study of the separation and identification of colors is desirable.

The associate referee on dairy products, H. C. Lythgoe, reported a study of methods for the preparation of milk serum and the detection of calcium sucrate in cream. A report of progress on work in cereal products, especially fat determinations in flour, was submitted by E. F. Ladd. W. L. Dubois, associate referee on vegetables, presented a study of the water content of fresh and soaked canned peas. A report on meat and fish was made by F. C. Weber. The work on preservatives, reported by W. D. Bigelow, discussed an attempt to simplify the quantitative estimation of salicylic and benzoic acids and the study of cinnamic acid, which is said to be coming into use by reason of its antiseptic properties. A. G. Woodman, associate referee on tea, coffee, and cocoa, reported cooperative work on caffein and tannic acid in coffee, sugar in tea, crude fiber and starch in chocolate and sugars in milk chocolate, and a special

study, made jointly with W. C. Taylor, was presented on the Estimation of Caffetannic Acid and Caffein in Coffee.

An unusual amount of attention was devoted by the association to the subject of medicinal plants and drugs. L. F. Kebler made an extended report as referee, followed by a paper by B. J. Howard, discussing Microchemical Methods for the Identification of Alkaloids in Drugs, and W. O. Emery outlined methods for the separation of caffein, acetanilid, and sodium bicarbonate. A paper on Pharmalogical Investigations on Effects of Drugs was presented by W. Salant, and Dr. H. H. Rusby gave an illustrated lecture on simple methods of detecting common drug adulterants.

The work of the year on meat proteids, presented by P. F. Trowbridge, took the form of the preparation and analysis of cold water extracts from different wholesale cuts of fresh beef from steers slaughtered in connection with feeding investigations at the Missouri Station. L. L. Van Slyke, referee, submitted a report on the separation of nitrogenous bodies (milk and cheese proteids), presenting cooperative work on a volumetric method of determining milk casein.

The referee on nitrogen, C. L. Penny, reported cooperative work on the determination of nitrate nitrogen. The report of the referee on inorganic plant constituents, H. D. Haskins, dealt with the development of a method for the determination of iron and aluminum in ash. C. C. McDonnell reported on insecticides and fungicides.

S. D. Averitt, referee on soils, reported cooperative work with reference to the determination of total potash and phosphorus, and J. G. Lipman, associate referee, submitted a report on the determination of calcium carbonate in soils. The work on potash reported by B. B. Ross, referee, included cooperative tests of the official method in comparison with the phospho-molybdic volumetric method with some cooperative work on special methods.

J. M. McCandless, referee on potash, reported cooperative work on the examination of basic slag, the determination of iron and aluminum in rock phosphate, and an examination of ammonium citrate solutions as to neutrality. Papers were submitted by J. B. Lindsey on Thomas slag, and by H. D. Haskins on The Valuation of Phosphoric Acid in Basic Slag, the latter recommending a study of Wagner's method.

The work on dairy products reported by the referee, J. M. Bartlett, was in continuation of that of the previous year on analytical methods of condensed milks. E. B. Holland submitted a paper on a Standard for Babcock Glassware, noted on p. 374 of this issue. F. W. Morse, associate referee on cattle foods, reported a study of a modification of Ellet's method for methyl pentosan. A paper was read by J. P. Street on The Determination of Acidity in Cattle Feeds, in which the need for further study of acidity, especially that due to protein bodies, was pointed out, and T. B. Wagner discussed the processes of manufacture of gluten feed with particular reference to color and acidity.

The work on sugar was reported by A. H. Bryan, referee, and Fritz Zerban, associate referee. Cooperative studies were presented on methods of moisture determination and the effect of clarifying agents on the polarization. The referee also submitted a subreport on The Use of the Refractometer in Determining Dry Substances, and papers on the detection of small quantities of glucose in sirups and honey and The Determination of Total Sulphur Dioxid in Molasses.

An innovation in the meetings was the setting aside of the final day of the convention for the reading of special papers and their discussion. The following papers were presented: Methods Relating to the Rate of Decomposition of

Organic Matter in the Soil, J. G. Lipman; Determination of Sulphurous Acid and Sulphites or Sulphur Dioxid in Food Products, E. Gudeman; The Possibilities of Muscovado Sugar as an Adulterant for Maple Products, R. E. Doolittle and A. F. Seeker; Notes on the Winton Lead Number of Mixtures of Cane and Maple Sirup, R. E. Doolittle and A. F. Seeker; A Discussion of Methods for Determining the Availability of Phosphoric Acid in Thomas Phosphate Powder (Basic Slag Phosphate), G. D. Leavens; The Determination of Fusel Oil in Distilled Liquors, A. S. Mitchell; Distilled Liquors, L. M. Tolman and W. E. Hillyer; Composition of Paprika, R. E. Doolittle and A. W. Ogden; Determination of the Iodin Number of the Nonvolatile Ether Extract of Paprika, W. Denis; Determination of Starch in Cocoa Products, W. L. Dubois; Examination of Oysters, W. D. Bigelow; Some Simple Methods for the Detection of Blended and Bleached Flours, A. L. Winton; Moisture Determinations without Heat, P. F. Trowbridge; The Unification of Polarimetric Observations, C. A. Browne; The Influence of Glycerin and Acetanilid in the Estimation of Alcohol in Pharmaceutical Preparations, L. E. Warren and H. C. Fuller; Citral Methods, C. O. Dodge; Citral and its Analysis in Terpeneless Oil of Lemon, S. H. Baer; The Identification of Coal Tar Colors, C. B. Cochran.

Reports of standing committees were presented by L. F. Kebler on testing chemical reagents and W. Frear on food standards, together with a subreport on Methods of Assaying Opium, by C. F. Parker. A report of progress was submitted by H. W. Wiley on fertilizer legislation, recommending postponement of further action until the next meeting. J. K. Haywood made a final report for the committee on revision of methods, stating that Bulletin 107 of the Bureau of Chemistry had been issued embodying such changes as were deemed necessary. A resolution was reported from the committee on resolutions by L. L. Van Slyke, advocating the enactment of Federal legislation regulating the composition and sale of insecticides and fungicides, and adopted by the association.

An amendment to the constitution proposed at the 1907 meeting was adopted, extending membership in the association to delegates from Canada and Mexico. The appointment of a committee of three to cooperate with similar committees from other organizations in this country in unifying methods for the analysis of fats and oils with a view to the establishment of an international commission for this purpose was authorized, but the membership of the committee has not as yet been announced. A referee and associate referee were authorized on waters, to study methods for the analysis of mineral, sanitary, irrigation and technical waters, an associate referee to consider the definition of the term "available potash," and two associate referees on drugs.

In accordance with a decision of the previous year a standing committee on recommendations and revision of methods was elected as follows: For three years, B. B. Ross, E. M. Chace, C. D. Howard; for two years, J. P. Street, F. W. Woll, A. L. Winton; and for one year, J. K. Haywood (chairman), F. P. Veitch, L. M. Tolman. The question of the adoption and printing of conversion tables was also referred to this committee. L. M. Tolman, M. E. Jaffa, A. B. Adams, R. J. Davidson, and H. E. Barnard were appointed a committee on the standardization of alcohol tables.

Officers were elected for the ensuing year as follows: President, W. D. Bigelow, Washington, D. C.; vice-president, W. A. Withers, Raleigh, N. C.; secretary, H. W. Wiley, Washington, D. C.; and additional members of the executive committee, E. F. Ladd, Fargo, N. Dak., and E. B. Holland, Amherst, Mass.

American Association of Farmers' Institute Workers.—The thirteenth annual meeting of this association was held in Washington, D. C., November 16 and 17. There were 257 delegates and visitors registered, representing 42 States, 1

Territory, and 3 provinces of Canada, besides one visitor each from New Zealand and the Transvaal. Secretary Wilson, of this Department, made a brief address, in which he described the sending out by the Department of demonstrators in different lines of farm practice, stating that "my experience in the Iowa Agricultural College of six years, my experience in the Department of Agriculture of twelve years has brought me back around again to the cap-sheaf of agriculture—the sending out of people to lecture to the farmers." The Commission on Country Life was in attendance at one of the sessions, and Chairman L. H. Bailey, of the commission, explained its object and invited suggestions for the betterment of country conditions. By invitation, the association attended as a body a meeting of the National Grange, which was then in session in Washington.

The annual presidential address, made by Dr. Tait Butler, in discussing the ways in which the institutes had been of service, affirmed that "the carrying of agricultural knowledge to the adult farmer and the instruction of the adult members of his family in household economy is naturally and unquestionably the true and legitimate field which should be chiefly if not exclusively cultivated by the farmers' institutes." The speaker strongly advocated increased Federal appropriations for the dissemination of agricultural information in this way. He also declared it to be "the duty of the farmers' institutes to give their aid and moral support to every institution, organization, and force that has for its object the upbuilding of a better agricultural civilization," and commended the women's institutes as a means to this end.

An address was also made by Dr. James W. Robertson, president of MacDonald College, on The MacDonald Movement for the Improvement of Rural Conditions in Canada, in which attention was directed to the immediate need for teachers of agriculture for the rural schools. President Robertson explained in some detail the method employed in Canada for supplying this need through the education of teachers in MacDonald College.

The reports of the standing committees showed that the institutes were rapidly developing, particularly in the direction of movable schools of agriculture, and of boys', girls', and women's institutes. The committee on movable schools reported that these schools were held during the year in 10 States and 5 Canadian provinces. In the opinion of the committee, "wherever movable schools have been held they have met with favor, and it seems that the time is now ripe for the very general adoption of this form of extension teaching."

The committee on boys' and girls' institutes called attention to the remarkable growth of this form of extension work, but expressed a belief that the first work of the institute in behalf of the boy and the girl is to be done with the parents. Among the new features developed during the year was the "farm encampment," where the boys live in tents and are taught in classes in such subjects as corn and live-stock judging, seed identification and tile draining. At one of these encampments a tented school of household science for girls was introduced, which proved a most interesting feature.

Women's institutes were strongly indorsed by the committee on that subject as having demonstrated, in localities where they have been long established, their great practical value in the refinement of farm homes and in the betterment of rural conditions in general.

The subjects in the general programme were mainly directed toward defining the status of the farmers' institute in its relation to other forms of agricultural education, Dean Davenport discussing the agricultural college, Director Burnett the experiment station, F. H. Hall the normal school, F. L. Stevens the agricultural high school, A. B. Graham the rural public schools, President J. H. Connell the agricultural journals, and Alva Agee the agricultural fair associations.

The papers and discussions in the main were to the effect that the farmers' institute occupies the position of field agent for agricultural education, that it provides a most effective channel for carrying agricultural information directly to the farmer who is unable to leave his occupation to go to school, and that it should broaden its work until it embraces other more advanced forms of extension work, and extend its efforts until all rural people have opportunity to enjoy its benefits.

The general progress of the farmers' institute movement in the United States was shown by the reports presented by the various State directors and by the Farmers' Institute Specialist of this Department. The latter report showed the number of sessions held by the regular institutes in 43 States and Territories to have been 14,059, with an attendance at regular and special institutes of 2,215,690. The appropriations to institutes in 46 States and Territories were $320,564, and the total number of institute lecturers in the employ of the State directors in 47 States and Territories was 1,118. In four of the provinces of Canada—Alberta, Quebec, Saskatchewan, and Ontario—the number of half-day sessions was 7,266, with a total attendance of 321,963. A remarkable development of institutes for women in Canada was shown by the report of the Province of Ontario, where 3,978 sessions were held with 93,951 in attendance.

A resolution was adopted indorsing the work already done in forwarding the interests of farmers' institutes by this Department through the Farmers' Institute Specialist, and requesting the executive committee of this association to confer as soon as practicable with the Secretary of Agriculture and with this Office relative to the needs of this work, and to urge upon Congress the appropriation of a sum sufficient to enable the Department adequately to develop it.

The officers elected for the ensuing year were: President, J. L. Ellsworth, Boston, Mass.; vice-president, G. A. Putnam, Toronto, Ontario; secretary-treasurer, John Hamilton, Washington, D. C.; executive committee, the president and the secretary ex-officio; A. M. Soule, Athens, Ga.; H. T. French, Moscow, Idaho; F. H. Hall, Aurora, Ill.

First International Congress for the Repression of Adulteration of Alimentary and Pharmaceutical Products.—This congress was held in Geneva, September 8–12, 1908. About 400 delegates were in attendance, 250 from France and the remainder representing 28 other nations. The chief business of the congress was the formulating of definitions of food and drug products for adoption as an international "codex alimentarius." The second congress will be held in Paris in 1909.

Miscellaneous.—Wm. Fawcett, Director of Public Gardens and Plantations, Jamaica, has retired.

Botanisches Centralblatt of August 11, 1908, records the death of Dr. F. Noll, professor of botany at the University of Halle, at the age of 50 years.

Sir Daniel Morris retired from the post of Imperial Commissioner of Agriculture for the West Indies, November 30.

Philippe de Vilmorin, the present head of the seed firm, Vilmorin, Andrieux et Cie., and well known among horticulturists and plant breeders of this country, has been nominated as Chevalier of the Legion of Honor of France.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

CONTENTS OF VOL. XX, NO. 5.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Cont'd.

U. S. Department of Agriculture.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XX. JANUARY, 1909. No. 5.

The recent convention of the Association of American Agricultural Colleges and Experiment Stations, of which a brief account is given in the present number of the Record, brought out very clearly the growing tendency to confine the functions of this association to matters relative to the more general problems connected with the organization and management of the institutions represented in the association. The great growth of these institutions and the expansion of the scope and variety of the educational and research enterprises under their control have greatly complicated their organization and brought to their managers many problems which in detail at least are different from those of other educational and scientific institutions. It is therefore very important that these institutions shall have a common meeting ground where the general principles governing the solution of these newer problems of education and research may be thoroughly discussed with a view to the establishment of standards, the differentiation of the local and common characteristics of the problems, and the elucidation of the various difficulties in the light of experience from many sources. As a delegate body, consisting chiefly of the presidents of colleges and directors of experiment stations, the association is especially qualified for work in this field. This has further been facilitated by the changes in the organization of the association which has limited the number of sections and committed so much important work to standing committees. Recent experience has indicated the desirability of carrying the plan involved in this organization further toward its logical conclusion. It has become clearer that papers of a technical character dealing with the methods and results of special researches are out of place in such an association. Care should therefore be taken in arranging the programmes so to word the questions to be discussed that the presentation of such technical matters will clearly be out of order. It also seems desirable further to restrict the number of matters to be brought forward at any one meeting. Considering the wide territory covered by the institutions and the consequent difference in point of view on many questions, it is very desirable that there should be opportunity for full discussion so that the con-

clusions reached will really represent the best judgment of the association. It is also very desirable that the members of the association should be able to give their undivided time and attention to the questions before the association at any one meeting.

There has of late been great activity in the organization of societies of agricultural specialists in various lines for the discussion of the problems in agricultural science relating to these specialties. This movement has progressed so far that naturally a desire has arisen for the affiliation of these organizations in order that provision may be made to promote their general interests and to permit the general discussion of matters in which all or several of them have a common interest. In the discussion of plans for affiliation one fundamental distinction needs to be kept ever in mind. Societies for the discussion of technical and scientific matters do well as a rule to reduce the amount of their administrative business to a minimum. Such business is apt to interfere with strict attention to the more important problems for which these societies are organized. Their times of meeting and their programmes should, therefore, be arranged so that their members can give undivided attention for the time being to the technical and scientific problems before them. It seems probable that the various societies representing branches of agricultural science can profitably arrange some plan of affiliation. It is much more doubtful whether the center of such affiliation should be the Association of American Agricultural Colleges and Experiment Stations. This association is so far devoted to the discussion of administrative questions that it has little in common with the scientific societies, and any close affiliation of the two kinds of organizations might easily prove disadvantageous to both. At any rate discussion of affiliation should recognize the difference of function dividing administrative and scientific organizations.

The growing importance of extension work in agriculture was emphasized at the recent convention of the Association of American Agricultural Colleges and Experiment Stations. Evidently the rapid expansion of this work is bringing new problems to the agricultural colleges and stations. The complicated structure of these institutions and the somewhat confused legislation under which many of them are organized will make the task of properly organizing and administering extension work a delicate and difficult one. There is therefore great need of careful study of the problems involved in such work, and particularly of its relation to the research and inside educational work. Without doubt the association will do well to make a thorough study of this matter. Its action at the recent convention was timely, and it is to be hoped that much attention will be given to the study of this question at the various institutions prior to the next meeting

of the association, when much discussion of extension problems may be expected.

The growing sentiment in favor of better utilization of all available agencies for promoting agricultural education was strongly emphasized in the prominence given to strictly educational features at the Second National Corn Exposition, held at Omaha, December 9–19, which is enthusiastically declared by an agricultural journal to have been "the most elaborate demonstration of farm products ever held in this country." Nearly ten thousand different exhibits relating more particularly to the production and utilization of farm crops and representing twenty-eight States, scattered from Connecticut to Washington, and from Minnesota to Texas, besides entries from Hawaii, Canada, Mexico, England, and Argentina, filled to overflowing the two hundred and fifty thousand square feet of floor space of the large auditorium and the special structures erected for the occasion. The prizes offered in the various contests aggregated in value over fifty thousand dollars. It is estimated that the total attendance was one hundred thousand, an average of ten thousand each day.

The magnitude of the exposition was alone such as to bring prominently to public notice the important position of American agriculture, but, as expressed by another farm journal, the exposition "was far more than a mere display of specimens. It was a short course of study." The more popular and spectacular features, together with those more directly for business purposes, were by no means disregarded, but a notable circumstance was the unusual attention devoted to educational phases, thereby making the exposition an educational agency, especially in the realm of farm crops, such as the International Live Stock Exposition has become in the field of animal production.

Although in name this was the second national corn exposition, the first having been held in Chicago, in October, 1907, the Omaha show was the first to be developed to so elaborate a degree. Like its predecessor, it was in name an exposition of corn, and maize and its products easily predominated, but the term was broadly interpreted to include other cereals, grasses, an alfalfa palace, special exhibits of the work of the agricultural colleges and experiment stations, a large exhibit of farm machinery, a model kitchen, a students' judging contest, and many other features of interest and value. A complete distillery plant for the production of denatured alcohol was in operation, under the auspices of the Bureau of Chemistry of this Department.

Over half of the entries were in what was known as the Junior Industrial Section. This consisted of exhibits from young people, and included displays of articles made from corn and other grains

by the pupils of both rural and city schools, and samples of the corn grown by boys' corn clubs and similar organizations, as well as by individuals. Many of these entries were extremely suggestive as indicative that appeal is being made with success to the farmer of the future as well as of the present.

The educational value of the corn exhibit was much enhanced by an ingenious arrangement through which the racks were so constructed as to make it possible to see every ear entered. Significant, indeed, was the very evident improvement in quality which has been brought about during the past few years. Hundreds of entries of large, well-matured, uniform samples, of rich color and high proportion of kernel to cob, met the eye in bewildering profusion and rendered extremely difficult the rating of the samples by the judges. In the wheat section there was not only an exhibit of improved types and strains, but the judging of the various samples themselves was also supplemented by milling and baking tests, thereby acquainting the grower in a practical way with the requirements and point of view of the miller and the consumer.

The object lessons from the exhibits were explained and emphasized anew by a large corps of lecturers and demonstrators. The speakers included men prominent in state and national affairs, a long list of scientists from this Department and the agricultural colleges and experiment stations, and many experts engaged in various commercial phases of the industries. Not infrequently the audience taxed the capacity of the two lecture halls which were available. A special feature was a two-day session of the Commission on Country Life, in which farmers, agricultural editors, professional and business men and many others participated.

The third day of the exposition was set aside by the management as Agricultural College Day, and special trains brought several hundreds of students from the nearby States for the occasion. But to a large degree the name might well have been applied to each and every day of the exposition, so prominent was the influence of these institutions and so apparent the confidence and esteem with which their work was regarded. In the main auditorium a prominent section was reserved for their special exhibits, twelve institutions presenting illustrative material with reference to their work both in general and with particular reference to those phases relating to crop improvement. Thus, Illinois showed that the protein content of corn could be increased by selection; Ohio that wheat must be improved by selection and not by the fanning mill; Indiana compared the results of continuous cropping with rotation in wheat growing; and Wisconsin showed how through the State Experiment Association improved seed has been distributed in the State. The Iowa and

Nebraska exhibits were especially elaborate, the former giving prominence to cultural methods and the latter to feeding problems and cereal diseases and insect pests.

A novel and instructive feature for women was what was known as the Model Kitchen. This was in reality a school of domestic science, and was under the management of the head of the domestic science department of the Iowa College, assisted by teachers of home economics from the Illinois and Missouri universities and elsewhere. Here a ten-day course was given to a class of young women numbering sixty, with daily demonstrations and lectures which were open to the general public.

For the farmers and experts in embryo—the students in the agricultural colleges—a special incentive was offered in the form of a judging contest. In this, teams from the Iowa and Kansas colleges and the Missouri University struggled in a keen but good-natured competition, finally won by the Iowa College, for the possession of prizes aggregating several thousand dollars in value. Among these were the grand sweepstakes trophy—a silver cup valued at fifteen hundred dollars and presented under the auspices of the Mexican Government to stimulate interest in corn judging—and a thousand-dollar trophy offered by the Western Grain Dealers' Association for the judging of oats. The contests involved the grading of selected and commercial samples of the different grains, and also a statement of the reasons for the judgments made; and there were public lectures by representatives of boards of trade and grain exchanges as to the methods of grading, buying, and selling. Thus the opportunities open to the students were much extended, and they gained both experience and training of a sort to stimulate and develop subsequent work in the class room.

A national exposition of this sort, if closely held to the educational purpose, presents very considerable possibilities in that field. Like most of the other forms of extension work, it is still in the experimental stage and now possesses the temporary advantage of novelty, which must soon to some extent be lost. Much of the instruction it imparts is admittedly more or less superficial in degree and ephemeral in effect, needing subsequent and continued stimulation through other channels to effect its greatest and most lasting value. As a means of arousing interest, however, of pointing out in a practical way the need of individual improvement, and in revealing the opportunities which scientific effort is developing, it may easily become a factor well worthy of consideration in the work of popularizing the results of agricultural research.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS, 1908.

The twenty-second annual convention of the association, held at Washington November 18–20, 1908, was characterized by good attendance and by an unusually interesting programme of papers, addresses, reports, and discussions. Over 200 delegates and visitors representing 48 States and Territories were in attendance. Among the visitors in attendance to whom the privileges of the floor were granted were F. B. Smith, Director of the Department of Agriculture of the Transvaal, Pretoria, South Africa; G. C. Creelman and C. A. Zavitz, of the Ontario Agricultural College, Guelph, Ontario, Canada; J. W. Robertson, of McDonald College, Ste. Anne de Bellevue, Province of Quebec, Canada; Edwin Hall, Secretary Auckland Agricultural Association, Auckland, New Zealand; and M. C. Rankin, Acting Commissioner of Agriculture of Kentucky. The large attendance was due in part to the fact that a number of other agricultural organizations, including Farmers' Institute Workers, National Association of State Universities, Society for the Promotion of Agricultural Science, American Society of Agronomy, and National Grange, were in session, and that the Country Life Commission held several hearings in Washington at the same time.

GENERAL SESSIONS.

The general sessions were presided over by President J. L. Snyder, who, in his presidential address, discussed Agriculture and Democracy, laying emphasis especially upon the relation of agriculture to other productive industries and the dependence of other industries upon agriculture. He pointed out that agriculture fosters a spirit of true democracy and developes character and provides conditions which are the true measure of the greatness of a nation. The growing needs of the future must be met by increased production by lands already under cultivation, not by increase of productive area. With the present rate of increase of population every State in the Union must practically double production within 50 years. Our democracy depends upon thus increasing production. Provisions for the maintenance of agencies for promoting agricultural production are therefore contributions to democracy, and this does not concern the farmer alone but every citizen of the Commonwealth. The scope and activities of educational agencies such as the agricultural colleges and the Department of Agriculture should be enlarged to meet the needs indi-

cated. It is not only incumbent upon the agricultural college to enlarge its own courses in various ways, but to take the leadership in securing improved rural education and better economic conditions in general. For example, production is increasing faster than transportation, therefore the improvement of the navigable waterways is of vital importance, and in this as in the conservation of the natural resources of the nation the agricultural colleges may profitably take an active part and must train more men for the greater demands of the future.

In accordance with suggestions contained in this address a committee consisting of J. L. Snyder, chairman, C. R. Van Hise, and R. W. Silvester was appointed to represent the association in its cooperative relations with the National Conservation Commission.

The report of the executive committee, presented by its chairman, H. C. White, briefly reviewed the work of the committee during the year, calling attention particularly to the appearance of the committee before committees of Congress in regard to matters affecting the association and this Office, and to conferences with the President of the Carnegie Foundation for the Advancement of Teaching, with a view to the admission of the land-grant colleges to the benefits of the foundation. Progress in bringing about a better understanding on this point was reported. At the invitation of the committee Dr. Henry S. Pritchett, president of the foundation, addressed the association, explaining frankly and fully the conditions under which the benefits of the foundation may be secured. By formal resolution the association expressed its profound appreciation of the great value to higher education of Mr. Carnegie's act in admitting tax-supported, State-controlled institutions to the benefits of the foundation, and its sense of gratitude for the benefits thus conferred upon American teachers. The resolution also conveyed "to the trustees of the foundation, and especially to its honored president, Dr. Henry S. Pritchett, its grateful acknowledgment of their sympathetic and helpful consideration of the land-grant colleges." Dr. H. C. White was requested to continue efforts to secure general recognition of the land-grant colleges by the foundation.

The report of the committee on graduate study dealt mainly with the Graduate School of Agriculture, the last session of which was held at Cornell University in July, 1908. The need of still more general support of this school on the part of the institutions represented in the association was especially emphasized. It was stated that "it is evident that the meaning of the school is becoming better appreciated by the colleges of agriculture. While the registration in the three successive schools has regularly increased and there is every reason to expect this increase to continue, yet it is the judgment of the committee that many of the institutions owe it to the cause of educa-

tion to take more active and appreciative interest in the Graduate School of Agriculture. This school is setting standards and developing ideals. These standards should be propagated everywhere. They are capable of greatly increasing the effectiveness of education by means of agriculture, and of extending its application. The committee thinks that every land-grant institution must accept the responsibility of furthering this enterprise. Moreover, it is also convinced that no land-grant institution can now expect to do the best work in education unless at least some of its staff actively participate in these graduate schools; and the administration of the institution must also officially recognize the type of work for which the graduate school stands. If for no other reason, the colleges should feel the obligation of cooperating in these schools for the purpose of increasing the supply of available teachers of agriculture.

"In short, the committee feels that the graduate school idea is now established, and far beyond the experimental stage. All the land-grant colleges must now recognize it."

Attention was also called to the injury which may result to the school by the holding of any considerable number of meetings of other organizations during the period of its sessions, a tendency toward which was apparent at the last session. The report of the dean of the school, A. C. True, showed that the last session of the school was very successful in point of attendance, breadth and interest of programme, and general results. An editorial account of the school has already appeared in the Record (E. S. R., 19, p. 1101).

Cordial invitations were received to hold the next school at St. Anthony Park, Minn., and Ames, Iowa.

An important feature of the proceedings was an address by Major-General J. Franklin Bell, Chief of Staff, U. S. Army, on Military Instruction in the Land-grant Colleges, emphasizing the importance of utilizing military instruction at these colleges as fully as possible as an aid in preparing for national defense. On the invitation of General Bell, the members of the convention took lunch at the War College and inspected the work of this institution. The thanks of the association were tendered General Bell, and the executive committee was instructed, if practicable, so to arrange the programme of the next meeting of the association "as to give one session in conference with the War College in relation to military instruction in the land-grant colleges, as suggested and requested by General Bell."

Commissioner E. E. Brown, of the U. S. Bureau of Education, addressed the convention briefly on the importance of enlarging the scope of the activities of the National Government with relation to agricultural education and of more perfect coordination of such instruction with the general work of education. He emphasized the importance of considering agricultural education as an essential

part of our general educational system. The desirability of enlarging the work of the Bureau of Education in its relation to the land-grant colleges was urged and the need of a central office for the promotion of various forms of vocational education was pointed out.

On invitation of the association, T. C. Atkeson, representing the National Grange, addressed the convention, discussing rural conditions in general and the relation of the work of the association and the Grange to the improvement of these conditions. A committee of three, consisting of J. L. Snyder, D. W. Working, and H. T. French, was appointed to visit the Grange, then in session in Washington.

A. C. True of this Office submitted a brief report for the special committee on history of agriculture, reporting progress in collecting data on this subject and asking the cooperation of the agricultural colleges.

The chief feature of the report of the bibliographer, A. C. True, was a statement by the Superintendent of Documents, W. L. Post, on the volume and character, and his methods of handling, cataloguing, and distributing government documents. The unfortunate confusion and lack of permanency as regards designated depositories for such documents was explained. Sale, at moderate prices, rather than gratuitous distribution of government documents, except to libraries, institutions of learning, and collaborators, was advocated. "We want all the libraries, colleges, and schools to understand that we stand ready to assist them in procuring either the information contained or the public document itself; that our services to them are entirely free and willingly bestowed, as are also the books when in stock; and that their interest in our methods and their friendly cooperation are what we need in order to continue to develop our plan of a clearing house for government publications, and a bureau of information regarding their contents."

The standing committee on instruction in agriculture reported progress of its subcommittee on domestic economy and gave an outline of a course in rural engineering prepared by another subcommittee.

The report of the standing committee on extension work made the following recommendations, which were approved by the association: (1) "That each institution represented in this association organize as soon as possible a definite scheme of extension work in agriculture;" (2) "that the association favor increased appropriations for the United States Department of Agriculture for the purpose of making investigations into all phases of the work of disseminating agricultural information, and of assisting the States in every practicable way to organize the work under the best auspices;" (3) "we strongly urge

that specific authority be granted by the association to this standing committee on extension work to make a study of this subject, and to report on it at a future meeting of the association." The recommendation that the association organize a section to be known as the section on extension work was indefinitely postponed, but C. F. Curtiss gave notice of a proposed amendment to the constitution, to lie over and be discussed and acted upon at the next convention, permitting the organization of such a section. The recommendations of the committee "that the association place itself on record in favor of a moderate Federal appropriation to be made to the land-grant colleges for the purpose of carrying on extension work in agriculture, under a plan which requires the States also to make appropriations for the work," and "that the association request Congress to extend the franking privilege to bona fide extension publications issued by the land-grant colleges," were referred to the section on college work and administration for approval as required by the constitution, but no action was reported by that section at this meeting.

The report of the standing committee on station organization and policy made important suggestions and recommendations regarding (1) the relation between the work of research and that of administration in experiment station policy, (2) permanence and continuity as prime essentials in station work, (3) inspection work in relation to other lines of station activity, and (4) relation of the working staff of the station to instruction in the college. The essential features of these recommendations have already been discussed editorially in the Record (E. S. R., 20, p. 303) and will not be further considered here.

Assistant Secretary Hays explained a system of project records which has been used with success in this Department and in several of the experiment stations. He thought that some such system as this might be made a useful means of adjusting administrative relations between different institutions and of securing better and more uniform methods, and might ultimately become, if generally adopted, something of a clearing house for administrative work.

A feature of the proceedings of great interest and importance was the report of the Commission on Agricultural Research appointed at the 1906 convention of the association "to inquire into and report to the association the organization and policy that in the opinion of the commission should prevail in the expenditure of public moneys provided for scientific experimentation and research in the interests of agriculture, to the end that such funds shall be applied in the most economical, efficient, and worthy manner to the production of results of permanent value." David Starr Jordan, Stanford University, California, as chairman, submitted a carefully prepared report embodying (1) a statement of present conditions affecting the efficiency of agricultural research, taking this term to mean "the scientific

investigation of unsolved problems that have a direct or indirect relation to agricultural practices or conditions," and not "academic or popular instruction or agricultural propaganda;" and (2) a series of recommendations which in the opinion of the commission "should guide in the promotion, organization and prosecution of research in agriculture." These recommendations, as far as they directly affect the work of the experiment stations, have already been reviewed editorially in the Record (E. S. R., 20, p. 301).

The executive committee was instructed to wait upon the Secretary of Agriculture and confer with him regarding the suggestion of the commission that an advisory board consisting of members appointed by the Secretary of Agriculture and by the association be formed to consider the mutual interests of the Department and the stations as well as agricultural investigation in general.

In accordance with a resolution of the association, a committee consisting of L. H. Bailey, H. C. White, C. R. Van Hise, T. F. Hunt, and L. G. Carpenter, was appointed to wait upon the President elect of the United States with reference to the future relations of the institutions represented in the association with this Department.

The high appreciation in which the services of Secretary Wilson as administrative head of the United States Department of Agriculture are held by the association was expressed in the following resolution adopted by the convention: "That we extend to Secretary Wilson the highest praise for his remarkable services as leader in the development of public efforts to improve the conditions of the American farmer and to place research and education in their relation to the farm, the farmer's home, and to our country life generally on a high plane and extend their influence very broadly among the masses of our agricultural people."

In accordance with a suggestion contained in the report of the chairman of the executive committee and a resolution introduced by K. L. Butterfield, of Massachusetts, the executive committee was instructed to take into consideration the matter of preparing for proper commemoration in 1912 of the fiftieth anniversary of the passage of the first Morrill Act and the fundamental law of the Department of Agriculture and the twenty-fifth anniversary of the passage of the Hatch Act.

The very general and active interest in the matter of affiliating various organizations dealing with agricultural science, which has been evidenced by the recent efforts of a number of these organizations to agree upon a satisfactory plan of affiliation, was indorsed by the association in the following resolution: "That this association heartily approves of the proposed affiliation of the various existing societies and associations organized for the consideration of subjects relating to agricultural science with a view of bringing all such efforts into

greater harmony and efficiency." The appointment of a committee of three to confer with the representatives of other organizations with regard to the formulation of a plan of affiliation was authorized. The committee appointed in accordance with this authorization consists of H. J. Waters, chairman, T. F. Hunt, and H. J. Wheeler.

The executive committee was instructed to give attention to the bill before Congress providing for the establishment of engineering experiment stations.

The officers chosen for the ensuing year were: President, M. A. Scovell, of Kentucky; vice-presidents, W. J. Kerr, of Oregon; C. E. Thorne, of Ohio; H. T. French, of Idaho; W. D. Gibbs, of New Hampshire; and A. B. Storms, of Iowa; secretary and treasurer, J. L. Hills, of Vermont; bibliographer, A. C. True, of this Office; executive committee, W. O. Thompson, of Ohio, chairman; J. L. Snyder, of Michigan; W. E. Stone, of Indiana; W. H. Jordan, of New York; and C. F. Curtiss, of Iowa.

P. H. Mell, of South Carolina, was chosen chairman of the section on college work and administration; W. J. Kerr, of Oregon, secretary. In the section on experiment station work, P. H. Rolfs, of Florida, was chosen chairman; E. J. Wickson, of California, vice-chairman; and F. B. Linfield, of Montana, secretary.

The vacancies in the committees occurring through the expiration of terms were filled by the following appointments: Committee on instruction in agriculture, A. C. True, of this Office, and T. F. Hunt, of Pennsylvania; committee on graduate study, H. P. Armsby, of Pennsylvania, and Howard Edwards, of Rhode Island; committee on extension work, K. L. Butterfield, of Massachusetts, and C. R. Van Hise, of Wisconsin; committee on experiment station organization and policy, E. Davenport, of Illinois, and C. D. Woods, of Maine.

Cordial invitations were received to hold the next convention of the association at Denver, Colorado, and Portland, Oregon.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

Four topics, educational policy, the value of general culture in technical courses, administrative methods, and military discipline, were considered in the college section.

One of the most interesting and valuable discussions of the meeting was that opened by Andrew Sledd with a paper on Rural *v.* Urban Conditions in the Determination of Educational Policy. President Sledd maintained that educational policy should be adapted to meet the specialized needs of different communities. He believes that the first object of an education is to raise standards of living on a purely physical basis. In rural communities, therefore, instruction in agriculture should be provided for first of all. But education should also give to life a satisfying content. For the farmer it is

desirable not only that the physical standard of living be raised but also that he be given training which will give him poise and contentment. The farmer should be a patriotic, high-thinking man, yet contented with life on the farm. To be this he must have opportunity for gaining a livelihood and also for society, recreation, and mental activity. This opportunity must come largely through a multiplication of educational centers. As against the establishment of one large, strong university or college in a State, democratic policy would favor a number of good smaller schools distributed over the State.

In any school system President Sledd believes that moderate specialization should begin early, but full specialization should not be reached till after the close of the college course. In the high schools the curve of specialization for the student who does not expect to go to college should rise sharply until it covers two-thirds of the course, but for the student who looks forward to a college course it should rise more slowly and cover at the end only about one-third of the course.

In discussing this paper H. C. White called attention to the fact that in this country communal environment is not fixed and argued from this that the matter of first importance in education is to provide the fundamentals in character building and mental development. He would also prefer one good institution of learning to ten less good. W. O. Thompson believed that education which is not utilitarian has no excuse for being—is not education, and called attention to some of the difficulties of providing proper instruction in rural schools, chief among which is that of securing competent teachers.

In the absence of C. C. Thach the discussion of The Value of General Culture in Technical Courses in the Land-grant Colleges was opened informally by G. E. Fellows, who argued that culture may be obtained from any subject which is so thoroughly taught as to make students efficient. He would introduce into the college course only so much of cultural studies as will fit graduates to associate with others and present their ideas effectively. J. K. Patterson argued strongly against cutting loose from traditions concerning the cultural value of classical studies.

A paper on Administrative Methods in American Colleges was presented by P. H. Mell, who outlined briefly four forms of college administration: (1) That form in which the whole college community takes part in government but which is applicable only to conditions in Europe, (2) government by trustees, (3) government by faculty, and (4) presidential government. He did not believe that the trustees should enter actively into the details of college administration but should manage the larger affairs of the college, provide and look after its finances, and fill vacancies, subject to the recommendation of the president. Government by faculty he considered too slow and

cumbersome for modern educational institutions and he therefore favored presidential government. The president should be a good business man but more than a money getter. He should be a good man, strong intellectually, broad minded, able to appear before men, patient and sympathetic, a ruler of men. The college is a business corporation engaged in educational enterprises and it should have at the head of it a single man of ability, who should represent the trustees on the one hand, the faculty on the other. He should have general supervision over discipline but should leave the details of it to others.

In discussing this paper W. E. Stone emphasized the points already brought out and called attention to the fact that the business of teachers in colleges is largely to give instruction and conduct research and they should, therefore, be relieved largely of administrative affairs. In the land-grant colleges and State universities there are many great problems which are not primarily educational and these should be left to the president. M. H. Buckham believed that members of boards of trustees should be impressed with the fact that they have no power except as members of the board, no individual relations to the colleges. W. E. Garrison maintained that the president should be held responsible for results but that he should have the advice of at least one man on his faculty occupying such a position as dean which would bring him in view of the whole field of college work. W. H. S. Demarest held that the discussion thus far tended to put the board of trustees too far away from the college and that the board should give some cognizance to details, in fact should let it be known that in very rare occasions it would consider grievances of students or faculties.

In the absence of H. H. Harrington and K. C. Babcock, the discussion of the extent to which military discipline should be applied in agricultural colleges was opened by W. J. Kerr, who held that many institutions, owing to difficulties arising from large attendance and lack of dormitory facilities which would hold the college community together, have been unable fully to meet the requirements of the War Department in this respect. He believed, however, that the minimum requirement of the War Department was not too great for institutions having suitable facilities for meeting this requirement. W. E. Stone, J. H. Connell, and John Hamilton of this Office thought that more attention should be given to the study of larger problems in military tactics, to sanitation, cookery, and other things which will come under the administration of army officers, and less attention to the manual features of military tactics. Presidents Nichols, Patterson, and Edwards were of the opinion that the value of the manual exercises should not be lost sight of, and the latter called attention to the fact that if the military drill during the full

four-year college course were condensed into ten-hour days it would amount to less than a month of actual drill.

SECTION ON EXPERIMENT STATION WORK.

The general subjects (chosen at the last convention) discussed in this section were: (1) Bovine tuberculosis and methods for its control, and (2) relation of the experiment station to work in instruction with special reference to its popular phase.

The general subject of spread and control of bovine tuberculosis was discussed by V. A. Moore, who pointed out that conditions favoring the spread of the disease are increasing and that even the most reliable test for the disease, viz, tuberculin, can not be depended upon except in progressive cases of the disease. The Bang method of handling the disease was commended, but efficient control in this country would involve (1) a widespread campaign of education, (2) the enactment of special laws and regulations to control the spread of the disease, (3) the utilization of infected herds, (4) the breeding up of healthy herds, and (5) sterilization of dairy by-products. It was stated that by judicious use of the means indicated the disease can be eliminated, but this end can be only slowly attained.

In discussing the relation of dairy by-products to the spread of tuberculosis, H. L. Russell called attention especially to the rapid spread of tuberculosis in calves and hogs by feeding infected milk and dairy by-products, hogs being especially susceptible. The use of the home separator to obviate the use of creamery skim milk and pasteurization of dairy by-products used for feeding stock were suggested as preventive measures. He urged a campaign of education as a necessary preliminary to effective legislation.

H. A. Harding discussed the practical application of the Bang method in this country. He was of the opinion that while the method may be successfully employed, it may not always be practicable. Cheap means of pasteurization are especially needed. Present methods are only applicable in high-priced herds.

In general discussion following the more formal presentation of the above phases of the subject, attention was called to the futility of attempts to eliminate the disease from herds where liberal compensation for destroyed animals is allowed and the matter is not closely followed up. Compulsory pasteurization of dairy by-products used as feed and compulsory testing with tuberculin of breeding stock were suggested as preventive measures. The successful introduction of the Bang method through breeders' associations in North Dakota was referred to by J. H. Shepperd.

In discussing the relation of the station to popular instruction, C. F. Curtiss stated that in some cases station men have had a multiplicity of duties, including (1) instruction, (2) investigation, and

(3) extension work, but that these should be separately and distinctly organized and adequately provided for. There is no advantage in mixing the three lines, and the day of the combination of teacher, investigator, institute worker, and popular writer is happily passing.

W. R. Dodson presented a consensus of opinion of station directors, showing a general approval of and tendency toward a rather sharp differentiation of investigation and instruction in all forms, although it is considered well for station men to do a limited amount of teaching and popular work in their special lines. Research only should be done under Federal funds, while extension work should be provided for by State funds, and the organization may be adjusted on this basis.

W. H. Jordan thought stations should be feeders and supply material for instruction, but that the efficient station worker can not engage to any large extent in popular work. There should be separate agencies for popular work.

E. D. Ball thought the combination college and station man still a necessity in some stations, but that certain lines of work are better suited to the mixed function than others.

L. G. Carpenter thought it was mainly a question of how far the ideal can be attained. There are at present many difficulties of organization to be overcome in certain institutions, particularly in the far West, where a wider scope is required under present conditions.

H. P. Armsby emphasized the fact that to secure the highest efficiency in research the conditions must be kept favorable to creative work. Station men must have opportunity to incubate ideas as well as to put them into execution.

J. L. Hills had found that conditions for research work may be improved by concentrating the various lines of work in different periods of the year.

C. D. Woods thought research should be strictly divorced from instruction and limited to a few of the most important problems.

E. A. Burnett believed in a separate force for publicity work and a limited number of lines of investigation.

F. B. Linfield considered a clear differentiation an ideal to be worked toward as fast as conditions would permit, but thought that this ideal is not at present attainable in some of the newer States.

E. D. Sanderson favored Federal appropriation for extension work.

The topics selected for discussion by the section at the next convention were (1) The Relation of Problems in Irrigation, Drainage, and Engineering, and (2) The Relation of Station Directors to Other Members of the Staff. The programme committee was authorized to change the first topic if in its judgment this should for any reason become desirable.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Determination of sodium and potassium in silicates, J. E. THOMSEN (*Jour. Amer. Chem. Soc., 30 (1908), No. 3, pp. 420, 421; abs. in Chem. Abs., 2 (1908), No. 17, pp. 2354, 2355*).—It is stated that the following method has been found rapid and satisfactory for the determination of sodium and potassium in clay and silicates which can be decomposed by sulphuric and hydrofluoric acid:

"One gm. of clay is decomposed by means of sulphuric and hydrofluoric acids, and the excess of sulphuric acid expelled in a hot-air bath. The residue is then dissolved in water and powdered barium hydroxid added to the boiling liquid to alkaline reaction. The solution is decanted and filtered, and the residue boiled again with water and thoroughly washed. Carbon dioxid is passed into the filtrate in excess, the solution evaporated to 50 cc., 25 cc. of alcohol (96 per cent) added, and the solution filtered and the residue washed with 50 per cent alcohol. A measured excess of tenth-normal hydrochloric acid is then added to the filtrate and the solution boiled to expel the carbon dioxid, litmus being used as an indicator and more acid being added, if necessary, to give a permanent acid reaction after boiling. The titration is then finished with tenth-normal sodium hydroxid. The solution is evaporated to dryness in platinum, dried at 110° and finally at very faint redness, and the residue of potassium and sodium chlorids weighed. The amount of each metal can be calculated on the following principle:

Let a=No. of cc. of tenth-normal HCl used less the No. of cc. of tenth-normal NaOH.
b=a×A 0.00585=weight of NaCl equivalent to sum of NaCl+KCl.
c=weight of NaCl+KCl formed less the weight of NaCl corresponding to the weight of NaOH used.
x=weight of Na.
y=weight of K.

Then $b=\frac{58.5}{23.05}x+\frac{58.5}{39.15}y.$

$c=\frac{58.5}{23.05}x+\frac{74.6}{39.15}y.$

$y=2.432\ (c-b).$

$x=\frac{23.05}{58.5}\left(c-\frac{74.6}{39.15}y\right)=0.3937\ c-0.75\ y.$

Determination of potash in soils, L. RONNET (*Ann. Chim. Analyt., 13 (1908), No. 4, pp. 141–143*).—The method proposed is as follows: Treat 25 gm. of the soil in a porcelain dish with a flat bottom 11 cm. in diameter with nitric acid until effervescence ceases. Add 25 cc. more of the acid and heat for 5 hours on a sand bath. Precipitate sulphuric acid with a few drops of saturated solution of barium nitrate. Evaporate to dryness and heat in a muffle at a low red heat until nitrous vapors disappear, the nitrates of iron and aluminum are completely decomposed, and the nitrates of calcium and magnesium partially decomposed. Take up in a little water and precipitate lime with 10 to 20 gm. of oxalic acid according to the lime content of the soil. Warm under cover

of a funnel in a sand bath. Evaporate to dryness and heat in a muffle at a low red heat until oxalic acid is completely removed. Pulverize the residue and wash with hot water into a 250 cc. flask. Allow the solution to stand over night, shaking from time to time. Make the volume to 250 cc. plus 10 cc. for volume of soil. Filter and evaporate 200 cc. of the solution, corresponding to 20 gm. of soil, and again treat the residue with oxalic acid. Filter and determine potash by adding hydrochloric acid and platinum chlorid or nitric acid and perchloric acid in the usual way. If it is desired to determine potash by weighing the reduced platinum, the method may be simplified by evaporating the 200 cc. directly with hydrochloric acid and platinum chlorid.

On a volumetric method for the determination of phosphoric acid in superphosphates, S. Kohn (*Chem. Ztg., 32 (1908), No. 39, pp. 475, 476; abs. in Chem. Zentbl., 1908, I, No. 26, p. 2205; Analyst, 33 (1908), No. 390, p. 376; Chem. Abs., 2 (1908), No. 18, p. 2529*).—The essential features of the method are titration of the water extract (20 gm. of superphosphate to 350 cc. of water) with sodium hydroxid solution, using methyl orange as indicator; addition of a large excess of neutral calcium chlorid solution; and further titration with the soda solution, using phenolphthalein as indicator. The results obtained agree well with those obtained with the citrate method.

The volumetric determination of water-soluble phosphoric acid in superphosphates, W. Moeller (*Chem. Ztg., 32 (1908), No. 53, pp. 631, 632; abs. in Chem. Zentbl., 1908, II, No. 5, p. 444; Chem. Abs., 2 (1908), No. 18, p. 2529*).—The author questions the accuracy of the Kohn method described above.

On the titration of phosphoric acid in superphosphate solutions, S. Kohn and L. Schucht (*Chem. Ztg., 32 (1908), No. 61, pp. 718, 719; abs. in Chem. Abs., 2 (1908), No. 20, p. 2767*).—In this article Kohn briefly discusses the contributions of Schucht and Littman to this subject and replies to criticisms of his method referred to above. The weaknesses of Kohn's method are commented upon by Schucht.

The systematic investigation of drinking waters, G. Romijn (*Pharm. Weekbl., 45 (1908), No. 15, pp. 402–412, fig. 1*).—The apparatus and procedure adapted to the systematic determination of chlorin, sulphuric acid, carbon dioxid, alkaline earths, nitrates, permanganate consumption, calcium and magnesium ions, and alkali ions are described.

Determination of combined carbonic acid in water, G. Lunge (*Ztschr. Angew. Chem., 21 (1908), No. 18, p. 833; abs. in Chem. Abs., 2 (1908), No. 14, p. 1942*).—The error of 33 per cent in temporary hardness reported by Noll in his tests of Lunge's method is attributed to the presence of a large amount of iron in the water. The author maintains that in ordinary waters containing small amounts of iron there is no appreciable error in the determination of temporary hardness.

The determination of combined carbon dioxid in water, H. Noll (*Ztschr. Angew. Chem., 21 (1908), No. 27, pp. 1455, 1456*).—A reply to the above statement of Lunge, maintaining that even with waters containing comparatively small amounts of iron the results by Lunge's method are too high.

Examination of eggs with colored shells, K. Borchmann (*Ztschr. Fleisch u. Milchhyg., 18 (1908), No. 6, pp. 182–184*).—The data reported have to do with the examination of wild birds' eggs marketed for food purposes. According to the author, water gave better results than salt solution in judging eggs by their specific gravity.

The formic acid content of honey, K. Farnsteiner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 10, pp. 598–604*).—The studies reported of the acid content of honey led to the conclusion that if formic acid is present it exists only in minute quantities, and the author recommends that for the

present free acid in honey be designated malic acid, and that the acidity be expressed in cubic centimeters of normal alkali solution per 100 gm. honey.

Methods for the analysis of maple products and the detection of adulterants, together with the interpretation of the results obtained, A. H. BRYAN (*U. S. Dept. Agr., Bur. Chem. Circ. 40, pp. 13*).—This compilation of methods of analysis of maple products has been prepared for the convenience of food analysts. The use and interpretation of analytical results in the detection of adulteration are discussed.

Amount of soluble silicic acid in cocoa beans, H. MATTHES and O. ROHDICH (*Ztschr. Öffentl. Chem., 14 (1908), No. 9, pp. 166–169*).—In the determinations reported the silicic acid content of different sorts of cocoa was found to vary considerably and the authors do not believe that quality can be judged by this constituent.

Plant fats and fat mixtures used in chocolate manufacture in the place of cocoa butter, O. SACHS (*Chem. Rev. Fett u. Harz Indus., 15 (1908), Nos. 1, pp. 9, 10; 2 pp. 30–33*).—The physical constants and other characteristics of different fats used in place of cocoa butter in chocolate manufacture are described and other data summarized with a view to the detection of such substitution.

Comparative tests of different methods of measuring fat in milk, E. DEHAYE (*Indus. Lait. [Paris], 33 (1908), No. 22, pp. 425–431*).—In the studies reported the author obtained larger results from chemical methods, such as the Adams method of fat extraction, than from the mechanical-chemical methods, such as the Gerber acid or salt method. In the case of fresh milk, or slightly acid homogenized milk, or milk partly skimmed, the results by the Adams method were slightly smaller than those by the Röse-Gottlieb method. In the author's opinion the latter method is to be preferred for exact determinations.

A milk constant as a basis of judgment, G. CORNALBA (*Indus. Lait. [Paris], 33 (1908), No. 26, pp. 495–499*).—In the data presented the soluble matter in milk has a fairly constant value, ranging from a minimum of 5.94 to a maximum of 6.44 per cent, while the insoluble matter in the same samples ranged from 5.05 to 8.58 per cent. In the author's opinion such a constant value offers the surest and most precise means of judging of the purity of milk, especially with respect to the addition of water.

Study of recent methods of analysis of butter, M. F. JEAN (*Indus. Lait. [Paris], 33 (1908), No. 22, pp. 431–434*).—Some methods recently proposed for detecting adulteration of butter were tested by use of pure butter alone and mixed with animal and vegetable fats. Several revealed adulteration when the latter equaled 10 per cent, but they failed to give positive evidence when it was not over 5 per cent. The method of Robin (E. S. R., 18, p. 709) is mentioned as of considerable value.

Regarding the nonsaponifying constituents of cocoa butter and their detection in mixture with butter, H. MATTHES and E. ACKERMANN (*Ber. Deut. Chem. Gesell., 41 (1908), No. 10, pp. 2000, 2001*).—This is a preliminary notice of investigations on a method of detecting the presence of cocoa fat in butter, depending on the facts stated by the authors that cocoa butter contains a phytosterin which gives customary color reactions but combines with 2 molecules of bromid and forms an acetattetrabromid, whereas butter does not form the latter compound. According to the method described, 1 kg. of cocoa butter upon repeated saponification and solution in ether yields 1.25 gm. of crude phytosterin with a melting point of 135 to 140° and 0.25 gm. of volatile constituents. The acetilized crude phytosterin (melting point 126 to 128°) is bromidized in ether and glacial acetic acid. Upon standing, thin plates with a melting point of 180 to 183° separate. From the filtrate after evaporation and recrystallization of

alcohol there is obtained a microcrystalline aggregate with melting point 132 to 135°, which is the melting point of phytosterinacetatdibromid.

Refractometric analysis of cognac, A. Frank (*Ztschr. Öffentl. Chem., 14 (1908), No. 10, pp. 185–194*).—The author describes a method of determining the alcohol and extract content of cognac from data for specific gravity and refraction, and gives a table showing the percentage of volume of alcohol corresponding to these values. He concludes that the refractometer method is to be recommended on the grounds of accuracy and simplicity.

Examination of feces for nitrogen of metabolic products, A. Stutzer, E. Merres, and L. Seidler (*Biochem. Ztschr., 9 (1908), No. 3–4, pp. 310–317*).—According to the reported data, sheep, goat, and rabbit feces may be preserved for analysis with carbon disulphid in the proportion of 1 cc. to 100 gm. feces. Fairly satisfactory results are also obtained when the feces are spread out and dried at ordinary room temperature. The dry material is extracted for 12 hours with specially prepared gastric juice and hydrochloric acid and the nitrogen determined in the undissolved residue and in the original material. The difference between these values gives the nitrogen of metabolic products.

The analysis of coal-tar creosote and cresylic acid sheep dips, R. M. Chapin (*U. S. Dept. Agr., Bur. Animal Indus. Bul. 107, pp. 7–35, fig. 1*).—This paper deals with methods of determining the various constituents of dips prepared from coal-tar derivatives. The commercial methods in use while rapid were found untrustworthy, undecomposed rosin being distilled along with the hydrocarbon and phenols even at 200° C. The scientific method requires many extractions and re-extractions and under certain conditions is also unreliable. In the method devised by the Bureau hydrocarbons are estimated by difference, water, soda, and pyridin bases, phenols, rosin acids, and other ingredients being determined by fairly simple volumetric processes. Result of tests made by the Bureau are reported.

"Methods exactly parallel to the methods employed in the analysis of dips may be applied to the valuation of creosote oil and cresylic acid which are to be used in making dips. . . .

"The agreement between the analysis of a dip made from analyzed materials with its calculated composition indicates that it is actually possible for a manufacturer to place on the market a dip of practically unvarying composition."

The analysis of turpentine by fractional distillation with steam, W. C. Geer (*U. S. Dept. Agr., Forest Serv. Circ. 152, pp. 5–29, figs. 17*).—A description of important changes in methods previously employed (E. S. R., 19, p. 682). By means of a new form of still-head, which is described, fractionations by dephlegmation are readily obtained. By using steam distillation the temperature can also be more easily regulated.

Results of the application of this method to 4 turpentines of different kinds are shown in graphical form. The color, odor, and maximum boiling temperature of all fractions were noted and specific gravity and index of refraction were determined.

"By introducing the principle of dephlegmation the separation of the constituents is made much more complete. . . .

"The low temperature at which the distillation is carried out reduces the danger of alteration of the sample during the analysis.

"The distillation is similar to certain technical distilling processes which have been found to give excellent results in practice and suggests the possible results of applying such methods to the refining of turpentines."

The examination of turpentine and turpentine substitutes, J. H. Coste (*Analyst, 33 (1908), No. 387, pp. 219–234*).—The author reports a study of

methods of examination of turpentine and describes processes which, while not novel, have been found useful in aiding the investigator to form an opinion as to the nature and quality of turpentine examined.

Proceedings of the Sixth International Congress of Applied Chemistry (*Atti 6. Cong. Internaz. Chim. Appl., 1906. Vols. 1, pp. XV+[413]+752, pls. 8, figs. 108, maps 2; 2, pp. XI+949, pls. 16, figs. 70; 3, pp. XII+919, figs. 19; 4, pp. XII+697, figs. 25; 5, pp. XV+844, figs. 13; 6, pp. XII+537, figs. 60; 7, pp. XX+812, figs. 3*).—A full report of the proceedings of the Sixth International Congress of Applied Chemistry at Rome, April 26 to March 3, 1906, with papers presented, discussions, and reports of committees.

Of special interest are the proceedings of the sections of organic chemistry and allied industries, fermentation and starches, wine making, agricultural chemistry, medical, pharmaceutical, and food chemistry, and the reports of the international committee on the analysis of commercial fertilizers and feeding stuffs, and the committee for the unification of methods for the analysis of food products. Several of the papers have been noted (E. S. R., 20, pp. 207, 208, 211, 218, 219, 222, 223, 225, 307, 384, and 456.

Report on progress in industrial inorganic chemistry, V. Hölbling and J. Preiss (*Chem. Indus. [Berlin], 31 (1908), Nos. 2, pp. 57–66; 3, pp. 83–96; 4, pp. 120–134*).—The feature of this article of greatest agricultural importance is the rather complete review of literature relating to the oxidation of atmospheric nitrogen and to ammonia and ammonium salts.

METEOROLOGY—WATER.

Annals of the Astrophysical Observatory of the Smithsonian Institution, C. G. Abbot and F. E. Fowle, Jr. (*Ann. Astrophys. Observ. Smithsn. Inst. 2 (1908), pp. XI+245, pls. 29, fig. 1*).—This volume reports "a continuation of the work on the relations of the sun to climate and life upon the earth" begun by Secretary Langley in "the hope that careful study of the radiation of the sun might eventually lead to the discovery of means of forecasting climatic conditions for some time in advance. It is believed that the present volume will aid materially to show how far that hope may be justified, for it contains careful and comparable measurements of the solar radiation, extending over several years. These indicate that the sun's radiation alters in its intensity from time to time, and that these alterations are sufficient to affect the temperature of the earth very appreciably. . . .

"From a comparison, extending over thirty years, of the temperatures of 47 stations well distributed over the land surface of the earth, it appears possible that changes of solar radiation do produce, not infrequently, well-marked and recognizable changes of temperature over the continental areas of the world. Such changes of temperature would be predictable if accurate measurements of the solar radiation were systematically continued at a few favorable stations."

The introductory part of the report gives annals of the Astrophysical Observatory 1900–1907. Part I deals with determination of the intensity of the solar radiation outside the earth's atmosphere, otherwise termed "the solar constant of radiation," including chapters on methods of determining the "solar constant of radiation," apparatus for "solar-constant" determinations, sample observations and computation of solar radiation outside the atmosphere, investigation of sources of error in the determination of the "solar constant," results of measurements of the intensity of solar radiation, applications of solar radiation measurements, and the causes of disagreement between the "solar-constant" determinations of different observers; Part II with radiation and terrestrial temperature, including chapters on the effect of the atmosphere on the direct

beam of the sun, the reflecting power of clouds, indirect solar radiation, income and outgo of heat from the earth and the dependence of its temperature thereon, and variations of solar radiation and their effects on the temperature of the earth; and Part III with the radiation of different parts of the sun's disk, including chapters of the phenomenon of varying brightness of the solar disk and possible explanations of it, arrangements for observing the distribution of radiation over the sun's disk, and results of observations of the brightness of the solar disk.

Solar heat received by the surface of the soil, J. Loisel (*Bul. Soc. Astron. France, 1908, May, pp. 229–232, figs. 2; abs. in Nature [London], 78 (1908), No. 2012, p. 66*).—This article discusses the relationships between the activity of various solar phenomena and the amount of heat received at the earth's surface. The discussion is based upon observations made at Montpellier during the period 1883 to 1901. "Plotting the actinometric results obtained at Montpellier, together with the frequency curves for sun spots, faculæ, and prominences, Doctor Loisel shows that they are distinctly analogous, but the terrestrial variation is an inversion of the solar variations."

On the origin of atmospheric ozone and the causes of variations in the carbon dioxid of the air, H. Henriet and M. Bouyssy (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 19, pp. 977, 978*).—This is a summary of results of extensive investigations which have been reported in other journals.

The investigations led to the conclusion that the ozone of the air results from the action of ultra-violet rays of the sun on the oxygen of the upper atmosphere, and is brought to the lower layers of the air by the winds and rains. When the air is very calm and clear a certain amount of ozone is formed in the lower layers of the air by the action of the sun's rays. All variations of the carbon dioxid below the normal are due to the upper air, the carbon dioxid thus varying inversely as the ozone. Variations above the normal are due to local causes such as respiration of men and animals in large cities, fires, exhalations from soils, and the like.

Meteorological observations at Storrs for the years 1905 and 1906, W. M. Esten (*Connecticut Storrs Sta. Rpt. 1907, pp. 163–179*).—This is a record of observations on temperature and precipitation during each month of 1905 and 1906 at Storrs, the rainfall during the six months ended October 31, 1905, and for the same period in 1906, at 20 places in Connecticut, a summary of rainfall for the six months ended October 31 for 20 places in Connecticut during the 17 years 1889–1905, the monthly mean temperature and monthly precipitation for 18 years (1888–1905), and dates of last and first killing frosts for 18 years.

Meteorological summary for 1906, C. A. Patton (*Ohio Sta. Bul. 185, pp. 295–310*).—This summary includes as usual notes on the weather of each month and tabulated daily and monthly records of observations at the station at Wooster, Ohio, on temperature, precipitation, cloudiness, direction of the wind, etc., and for comparison, similar data for 19 previous years (1888–1906) at the station and for 24 years (1883–1906) in other parts of the State.

The mean temperature for the year at the station was 50.7° F.; for the State 51.6°; the highest temperature at the station 92°, June 29; for the State 101°, August 21; the lowest temperature at the station —14, February 7; for the State —23°, February 6. The annual rainfall at the station was 42.8 in., for the State 36.87 in. The number of rainy days at the station was 142, for the State 124. The prevailing direction of the wind was south at the station and southwest for the State.

The weather during the agricultural year, 1906–7, F. J. Brodie (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 289–296*).—Data are given for rainfall, temperature, and sunshine at various points in the United Kingdom during 1906–7

as compared with previous years, and the general seasonal conditions are discussed. The meteorological conditions of the year are reported as on the whole favorable from an agricultural standpoint.

Climatology (*Bul. Off. État Indépend. Congo, 24 (1908), No. 5, Sup., pp. 167–190, dgms. 11, map 1*).—The mean annual and monthly rainfall and number of rainy days as observed during a number of years at various places in the Congo Free State are shown in diagrams and the distribution of rainfall during each month is shown on colored maps.

Present trend of investigation on underground waters, J. F. Kemp (*Abs. in Science, n. ser., 28 (1908), No. 715, p. 352*).—This is an abstract of a paper presented before the New York Academy of Sciences in which the author states that "within a few years there has been a marked change of views upon the sources, distribution, and extent of underground waters. . . . Now a very large number of geologists have come to regard the underground water as limited to a comparatively shallow zone; to refer uprising heated waters from deeper zones to magmatic sources in cooling and consolidating bodies of igneous rock; and to attribute some part of the underground waters to the same place of origin. In the interpretation of ore bodies magmatic waters have been found to be much more reasonable agents of deposition, in many cases, than are the meteoric."

The author presents figures from which he concludes "that meteoric sources and underground amounts have been much overestimated."

A study of the waters of Rio Verde from the standpoint of potability and agricultural value, M. P. Urbina (*Estac. Agr. Expt. Rio Verde, San Luis Potosí, Bol. 2, pp. 63, pls. 9*).—Detailed examinations of a number of samples are reported and discussed from the standpoint of suitability for drinking purposes and for use in irrigation. The waters are not as a rule suitable for drinking purposes. They are generally very clear, but contain considerable amounts of soluble salts. For these reasons little benefit is derived by the soil from use of the waters in warping, and soils receiving liberal applications of the water should be well drained to prevent accumulation of alkali.

Water supply for villages, W. Pitelps (*Jour. Bd. Agr. [London], 15 (1908), No. 5, pp. 350–355*).—The importance of giving more attention to providing an adequate, wholesome, and cheap water supply for rural towns and villages is pointed out. The number of dairy cows kept in a given locality is suggested as a basis for estimating the amount of water required.

A comparison is made of the consumption and cost of water with and without the use of meters. It was found in many cases that where the meter system was not in use 10 to 20 gal. of water per head of stock was used. With the meter system, however, the amount was greatly reduced.

The broad irrigation sewage farm at Fresno, California (*Engin. Rec., 58 (1908), No. 8, pp. 207, 208, figs. 3*).—This is a brief account of a sewage disposal plant consisting of a septic tank and a tract of 812 acres of land suitable for broad irrigation, which has been in quite satisfactory operation at Fresno, California, since December 28, 1907. The plant disposes of the sewage of a population of 30,000.

Elements of water bacteriology, with special reference to sanitary water analysis, S. C. Prescott and C. E. A. Winslow (*New York and London, 1908, 2. ed., pp. XII+258, fig. 1*).—It is stated that the aim of the author in preparing this new edition was "to include the results of the work of the last four years which bear on the practical investigation of sanitary questions connected with water supply." Considerable additions have been made to the treatment of the problems of self-purification, the description of methods for the isolation of the typhoid bacillus, the treatment of the interpretation of the colon test, an account of the newer presumptive tests for *Bacillus coli*, and the discussion of

the significance of intestinal bacteria other than *B. coli*. "A new chapter has been introduced on the bacteriology of sewage and sewage effluents, in recognition of the growing importance of this branch of the subject."

SOILS—FERTILIZERS.

The production of active nitrogen in the soil, G. S. Fraps (*Texas Sta. Bul. 106, pp. 4–31, figs. 5*).—This bulletin reports the results of laboratory studies of the rate of ammonification and nitrification in different kinds of Texas soils under varying conditions of basicity, acidity, fertilization, and moisture, as well as of pot experiments to determine the relation of the rate of production of active nitrogen to plant growth. The sum of ammonia and nitrates is considered active nitrogen.

The method of procedure in the laboratory studies was in general as follows:

"Five hundred gm. of air-dry soil, which had been sifted through a 3 mm. sieve, was mixed with 20 gm. of fresh garden earth, an amount of nitrogenous substance containing 0.3 gm. nitrogen, and water equal to one-third of the saturation capacity of the soil. The nitrogenous substance and the garden earth were first mixed together, then these were incorporated with the dry soil, the water added, and the whole mixed thoroughly until the mass was uniform.

"The mixture was then placed in 500 cc. precipitating jars, shaking it down by tapping gently against a wooden block. A test tube, with a small perforation in the end, was inserted to a depth of about 1 in., and the jar, with its contents, was weighed and placed in a water bath kept as nearly as possible at 35° C. . . .

"Every Monday, Wednesday, and Friday each jar was placed on a coarse balance and water added slowly through the test tube until its original weight was restored. This method of supplying the water retains the surface of the soil in an open, porous condition.

"After 4 weeks the contents of the jar were mixed thoroughly. One hundred gm. were placed in a funnel on a perforated porcelain disc, and washed with water until the volume of the filtrate was about 100 cc. Nitrates were then determined in the filtrate by the Tiemann-Schulze method and calculated to the original, air-dry weight of the mixture.

"For the ammonia determination, an amount equal to 200 gm. of the dry soil was placed in a flask with dilute hydrochloric acid (1:25) in quantity sufficient to make 500 cc. with the water already present in the sample. The mixture of soil and acid was shaken thoroughly, filtered after standing over night, and 250 cc. of the filtrate distilled with magnesia. The ammonia was caught in standard acid and the solution titrated back with ammonia. Correction was made for the ammonia in the reagents. Both nitric and ammonical nitrogen were corrected from the quantity present in the original soil. . . .

"The saturation capacity of the soil was estimated as follows: Fifty gm. soil are placed in a 1¾ in. carbon filter on a perforated porcelain plate, weighed, and water added until the soil is saturated. After the soil has drained 15 minutes, protected from evaporation, the apparatus is weighed again. The gain in weight is the saturation capacity, and is expressed in percentage of the original soil."

Basicity of the soils was determined by three methods as follows:

"(1) Ten gm. of soil were digested with 100 cc. fifth-normal nitric acid for 12 hours, and 10 cc. of the filtrate was titrated with caustic soda and phenolphthalein. Since salts of iron and aluminum are acid to this indicator and the corresponding hydroxids are precipitated during the titration, this method does

not include the basicity due to bases of iron and aluminum. The basicity measured is due to carbonate and easily decomposed silicates of lime, magnesia, and the alkalis.

"(2) Fifty gm. of soil were digested with 100 cc. tenth-normal nitric acid for one-half hour, and 20 cc. of the filtrate titrated with caustic soda and methyl orange.

"(3) After the titration in (2) phenolphthalein was added and the titration continued until the solution became slightly colored. The difference between methods (2) and (3) consists in the fact that (2) includes basicity due to iron and aluminum in addition to lime, magnesia, and alkalis, while (3) includes only lime, magnesia, and alkalis."

In connection with the pot experiments the method of procedure was as follows:

"Five hundred gm. of the soil were placed in a 500 cc. precipitating jar and 100 cc. of water poured on the surface of the soil. A test tube perforated at the bottom reached to the bottom of each jar. The soil was thus ventilated at the bottom, as in the pot experiments. The jars were kept in a dark cupboard at the room temperature and did not receive any further addition of water during the period of experiment. At the end of the time they were weighed, mixed thoroughly, and portions taken for analysis. . . . The results of the analysis were calculated to the original weight of the soil.

"Vegetation experiments were made on the same soil in galvanized iron pots 8 in. in diameter and 8 in. deep with a 1-in. side tube (Wagner pot). The pot was ventilated from the bottom, a layer of gravel was first introduced, and 5 kg. of soil were weighed into each pot. Each pot received 2.5 gm. acid phosphate and 1 gm. potassium sulphate. The corn planted was grown for various periods in the different soils. The period of growth was the same, however, as the length of time during which the soil was allowed to nitrify in the jars. The effect on plant growth of other additions to the soil was studied at the same time. Most of the tests with nitrogen were made in duplicate.

"At the end of about 9 weeks the corn was harvested, dried, and subjected to analysis."

It was found in these experiments that soils vary considerably in ability to produce nitrates, but to a much less extent in their capacity to produce active nitrogen. While an excess of water may entirely prevent nitrification, it retarded the production of active nitrogen to a much less extent.

"No relation could be observed between the increased production of nitrates due to calcium carbonate, and the acidity or basicity of the soils estimated by the methods described, though the greatest increase was effected on the most acid soil.

"Although the addition of carbonate of lime increased the production of nitrates in most of the soils, the production of active nitrogen was affected thereby only to a slight extent.

"Magnesium carbonate was less favorable to nitrification in the soil tested than calcium carbonate.

"Nitrification was much greater in a limed acid soil than in the unlimed acid soil.

"Phosphoric acid and potash had little effect upon the production of active nitrogen, though in some cases nitrification was affected considerably.

"The formation of ammonia begins rapidly, and a large proportion of the change takes place the first week, under Texas conditions. Nitrification began the second week and reached its maximum in the third.

"At the end of 56 days, under very favorable conditions, a large portion of the active nitrogen produced from cotton-seed meal was still in the form of ammonia.

"While the rank of nitrogenous fertilizers measured by the nitrates formed varies according to the nature of the soil, the relative production of active nitrogen is much less variable and depends upon the nature of the material. This offers a method for comparing the values of different nitrogenous fertilizers. . . . In most cases a greater quantity of nitrogen was taken up by the plants than would be produced in the jars, due to more favorable conditions in the pots for the transformation of nitrogen to active forms.

"Nitrogen content of the crop, as a rule, increased with the active nitrogen produced in the soil.

"All soils yielding less than 7 parts per million of nitric nitrogen, or 9 parts of active nitrogen in the jars, were highly deficient in the pot tests. In no case was the crop larger than 8 gm., and the addition of nitrates increased the crop four-fold or more.

"Soils yielding 7 to 22 parts per million of nitric nitrogen, or 9 to 27 parts of active nitrogen, appear to be deficient in nitrogen.

"Of nine soils yielding 27 parts per million of active nitrogen in the jars, four appeared to supply sufficient nitrogen to the crop, two responded slightly to nitrates, while three responded considerably.

"The soils containing 0.02 per cent nitrogen were very deficient in nitrogen and produced the smallest quantities of active nitrogen. On an average, the production of active nitrogen increased with the nitrogen content of the soil, though the results with individual soils were irregular.

"Six soils containing an average of 0.12 per cent total nitrogen contained an average of 59 parts per million of active nitrogen, this being 5 per cent of the total. Six soils, with an average nitrogen content of 0.8 per cent, and five with an average of 0.026 per cent, contained 21 and 7 parts per million of active nitrogen, being 2.5 and 2.7 per cent of the total. The nitrogen of soils containing high percentages appears to be more available than that containing low percentages.

"The production of active nitrogen in the soil can probably be developed into a method for the determination of the needs of the soil for nitrogenous fertilizers.

"Certain of the soils subjected to study contained a considerable proportion of their active nitrogen in the form of ammonia. . . .

"At the end of 4 or even 8 weeks a large portion of the active nitrogen produced from organic nitrogen fertilizers was present as ammonia, even though the conditions were very favorable for their conversion into nitrates. It appears that ammonia must play a not insignificant part in plant nutrition, when fertilizer or manure is applied."

Absorption by soils, H. E. Patton and W. H. Waggaman (*U. S. Dept. Agr., Bur. Soils Bul. 52, pp. 95, figs. 8*).—This bulletin summarizes the literature relating to the absorption of solids from solution, and reports results of investigations carried on in the laboratory of the Bureau of Soils in continuation of the general work on soil absorption which has been under way for several years.

After a résumé of earlier work, the bulletin takes up in detail the results of investigations on selective absorption with carbon, gelatin, soil, paper, cotton, barium sulphate, kaolin, clay, copper hydroxid, dyes, etc.; absorption by soils of picric acid and dyes from various solvents; distribution of different soluble salts between absorbent and solvent; rate of absorption (formulas); energy changes (heat evolved); condition of the absorbed sub-

stance; effect of absorption upon the physical condition of the soil; and percolation, including reclamation of black alkali soil by leaching, efficiency of calcium sulphate in removing black alkali, and absorption of potassium from carbonate solution.

"The principal object of this work has been to determine how absorption controls the concentration of the soil solution, which is the great nutrient medium upon which plants feed, and, further, to determine the effect of absorption upon the structure of the solid portion of the soil in modifying its power to hold and maintain the soil solution for the continued use of the plant. As a result of this work it has been shown that a number of modifying factors enter into each particular case, which makes it impracticable to formulate a simple general law which will account quantitatively for the distribution of a dissolved substance between the liquid solution and the absorbing medium, although it is brought out very clearly that under the ideal conditions, where there is no change in the surface of the absorbing medium, a simple mathematical law can be predicated a priori, which law is approximately realized in practice in those cases where it is known that the least amount of change takes place in the absorbing surface. . . .

"In the experiments described the materials used are not always fertilizer salts or constituents of the soil itself, since other substances, particularly certain dyestuffs, are better adapted to obtaining a more detailed knowledge of the mechanism of absorption. In general, it may now be stated that where disturbing influences are not great the mathematical formulation may be made both of the time rate and of the absorption and distribution of the material between the solid and the liquid. The disturbing influences, however, are quite important in most cases actually met in practice, and therefore a detailed study of some of them was undertaken. The most important of these is the change in the physical character of the soil itself, consequent upon the absorption of the dissolved materials. In some cases, notably with acids and with lime, the soils assume a 'flocculated' structure, i. e., a great many of the ultimate grains form larger aggregates or 'ball together;' and in other cases, especially with alkalis, the soils are deflocculated, each grain standing out separate and distinct from the others. This change in the structure of the soil is of the utmost importance in influencing the physical condition of the soil, which in turn influences the drainage condition, the aeration of the soil, its capacity to hold the soil solution and control its movement through the soil, the composition of the soil solution, the character and rate of the chemical changes taking place in the soil solution; and, in fact, in influencing directly both the physical and chemical factors which are the most important in governing the proper growth of plants."

The results of experiments with alkali soils from Yakima, Wash., and Fresno, Cal., indicate that "neutral salts, such as chlorids, in the presence of carbonates are comparatively easy to leach from the soil. With continued leaching of the soils containing 'black alkali' there is an increase in the rate at which percolation takes place, due probably to the reduction of the amount of alkali present and to a consequent effect on the physical structure of the soil. With continued leaching there is a comparatively rapid reduction of normal carbonates in the soil water, due in large measure to conversion to bicarbonates. Bicarbonates are rapidly removed at first and then continue to be slowly removed in the soil water in very small quantities, diminishing for an indefinite period. The leaching curves conform fairly well to the rate equation, $\frac{dy}{dr}=K\ (A-y)$, proposed by Schreiner and Failyer. Soils containing 'black alkali' can be reclaimed by leaching (i. e., flooding with underdrainage), but

the time and amount of water required is probably much greater than in the case of 'white alkali.'"

The results of the experiments with these soils also "indicate that the use of gypsum facilitates the removal of black alkali from soil, although at the same time it adds to the total quantity of alkali present."

Seven years' soil investigation in southern Illinois, C. G. HOPKINS, J. H. PETTIT, and J. E. READHIMER (*Illinois Sta. Circ. 122, pp. 4*).—The results of experiments with various methods of improving the soil are briefly summarized.

The maintenance of fertility (*Ohio Sta. Bul. 184, pp. 229–305*).—This bulletin contains in full data previously reported in Bulletins 110, 182, and 183 of the station (E. S. R., 12, p. 127; 19, pp. 315, 720) covering statistics of field experiments on this subject from 1894 to 1906 inclusive.

Plans and summary tables of the experiments at the central farm, Wooster, on the maintenance of soil fertility arranged for reference in the field (*Ohio Sta. Circ. 83, pp. 24, dgms. 6*).—A brief summary and explanation of experiments in continuation of those previously noted (see above), giving data for the season of 1907.

Farmyard manure, A. D. HALL (*Jour. Bd. Agr. [London], 15 (1908), Nos. 1, pp. 7–21; 3, pp. 161–176*).—This is a discussion of the losses during making and storage of manure and its value as a fertilizer, based upon practical observations and investigations at Rothamsted and elsewhere. The economy of manuring and of the supplemental use of commercial fertilizers under various conditions of British farming receives particular attention.

Contribution to the knowledge of the microflora of barnyard manure, F. LÖHNIS and W. KUNTZE (*Centbl. Bakt. [etc.]. 2. Abt., 20 (1908), No. 21–23, pp. 676–687*).—Investigations as to the number, character, and activity of various organisms found in manure are reported.

Green manuring experiments, A. ZIMMERMANN (*Pflanzer, 3 (1907), No. 10, pp. 152–156; 4 (1908), No. 3, pp. 33–36*).—Experiments with lupines, Japan clover, and a number of native plants, including species of Crotalaria, Desmodium, Melilotus, and Indigofera, are reported. Of the less common plants tested certain of the Crotalaria and Desmodium gave good results as green manures. The Crotalaria, however, was worthless as a feed, while the Desmodium apparently possessed considerable value for this purpose.

The nitrogen question, A. GRÉGOIRE (*Rev. Econ. Internat., 5 (1908), II, No. 2, pp. 431–446*).—This article discusses the various sources of nitrogen for agricultural purposes and urges especially the more careful utilization of the nitrogen supplies of the farm.

Experiments with nitrogenous fertilizers, C. SCHREIBER (*Rev. Gén. Agron., n. ser., 3 (1908), Nos. 3, pp. 97–105, fig. 1; 4, pp. 145–153, figs. 3*).—The fertilizing values of nitrate of soda, sulphate of ammonia, and calcium cyanamid on oats, corn, and carrots grown in pots containing 6 kg. of loam soil are reported.

In these experiments the average fertilizing effect of the sulphate of ammonia was 77.8 per cent of that of nitrate of soda in experiments in which calcium carbonate was not used, and 81.5 per cent in experiments in which calcium carbonate was applied. The addition of calcium carbonate was beneficial even in case of soils containing a sufficent amount of lime. The results obtained with sulphate of ammonia were much higher in this series of experiments than in an earlier series, due to the fact that the climatic conditions were more favorable, sulphate of ammonia being much more sensitive to such conditions than nitrate of soda.

The average fertilizing effect of the calcium cyanamid was 69.7 per cent of that of nitrate of soda when calcium carbonate was not used and 67.7 per cent

when the carbonate was applied. The injurious effect of the additional application of lime was especially marked in case of oats in the early stages of growth. In some of the experiments in which calcium carbonate was not used the cyanamid was used in much larger amounts than would be employed in practice without evidence of injury to the plants at any period of their growth.

Investigations on the action of sulphate of ammonia and nitrate of soda as fertilizers, E. Blobel (*Untersuchungen über den Wirkungswert von schwefelsaurem Ammoniak und Chilisalpeter als Düngemittel. Inaug. Diss. Leipsic, 1908, pp. 100; abs. in Chem. Ztg., 32 (1908), No. 42, Repert., p. 274*).—From numerous investigations made on the subject the author concludes that the normal fertilizing value of the nitrogen of ammonium sulphate is equal to that of nitrate of soda and not 90 per cent of it, as stated by Wagner. It is impossible, however, to state a normal for the effect in the field, because of the various modifying and uncontrolled influences there. Averages of results of field experiments are, therefore, unreliable. The author claims that the nitrification of the ammonium sulphate is complete and not accompanied by any loss of nitrogen, as maintained by Wagner, and that, contrary to Wagner's assertion, serious loss of ammonia by evaporation seldom occurs.

It should be borne in mind in comparing the fertilizing value of the two materials that the ammonium salt must first be converted into nitrate and that in this process more or less of the nitrogen is fixed for a time by bacterial action in organic form. For this reason the nitrate gives quicker results than the sulphate and is better suited for top-dressing and certain other purposes. On the other hand, the nitrate is more subject to loss by leaching.

Nitrate of soda and sulphate of ammonia, A. Damseaux (*Ann. Gembloux, 18 (1908), No. 6, pp. 354–360*).—A brief review is given of Wagner's investigations on this subject.

On the properties and action of sulphate of ammonia containing a large amount of free sulphuric acid, Lemmermann (*Fühling's Landw. Ztg., 57 (1908), No. 9, pp. 334–339*).—No injurious effects were observed in experiments on barley with sulphate of ammonia containing 3 per cent of free sulphuric acid. The average amount of free sulphuric acid in German sulphate of ammonia is said not to exceed 0.8 per cent.

The effect of the new nitrogenous fertilizers on hemp, V. Stöhr (*Hospodar Moravsky, Brünn, 9 (1907), No. 20; abs. in Zentbl. Agr. Chem., 37 (1908), No. 4, pp. 229–233; Jour. Chem. Soc. [London], 94 (1908), No. 547, II, p. 421*).—In pot tests basic lime nitrate was as effective as sodium nitrate and ammonium sulphate. Lime nitrogen and nitrogen lime were less effective.

Comparative fertilizer experiments with nitrogen lime and nitrate of soda, R. Kuhnert (*Landw. Wchnbl. Schles. Holst., 58 (1908), No. 19, pp. 366–368*).—In these experiments the use of nitrogen lime resulted in a financial loss in the case of beets. With rye and oats somewhat better results were obtained, but the increased yield barely covered the expense of the fertilizer. Profitable returns were obtained in all cases with the nitrate of soda.

Nitrogen fertilizers, especially lime niter, lime nitrogen, and nitrogen lime, A. Stutzer (*Jahrb. Deut. Landw. Gesell., 23 (1908), No. 1, pp. 41–50*).—This article discusses the relative efficiency of these forms of nitrogenous fertilizers on different kinds of soils and crops.

On the influence of sterilization on the solubility of lime nitrogen, H. Kappen (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 21–23, pp. 704–715; abs. in Chem. Ztg., 32 (1908), No. 50, Repert., p. 323; Chem. Zentbl., 1908, I, No. 26, p. 2198; Jour. Chem. Soc. [London], 94 (1908), No. 547, II, p. 414*).—It is maintained in this article that the sterilization of lime-nitrogen solutions brings about pronounced changes which may materially modify bacterial action in such

solutions. Instead of attempting to sterilize such solutions the solid substances should be sterilized by dry heat.

The behavior of lime nitrogen in storage, H. von Feilitzen (*Chem. Ztg., 32 (1908), No. 45, p. 542; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 13, p. 696*).—Data are reported which indicate that "calcium cyanamid, when carefully packed in wooden barrels, lined with paper, may be kept for many months in good condition, and almost unchanged in composition."

Experiments with calcium cyanamid, 1907 (*Agr. Students' Gaz., n. ser., 13 (1908), No. 6, pp. 186, 187*).—Comparative tests of ammonium sulphate, sodium nitrate, and calcium cyanamid on barley and mangel-wurzels are briefly reported. The conclusion drawn from the results of these tests "is that calcium cyanamid judiciously applied, is a good nitrogenous manure on this soil."

The fertilizing action of calcium cyanamid, S. de Grazia (*Rend. Soc. Chim. Roma, 5 (1907), No. 19, pp. 244, 245*).—The author studied the effect of varying amounts of water in the soil on the fertilizing value of the cyanamid. The best results were obtained with the larger amounts of water. This is thought to be due to the fact that dicyandiamid is formed from the cyanamid in relatively concentrated solutions.

The manufacture of calcium cyanamid, J. B. C. Kershaw (*Electrical World, 51 (1908), No. 19, pp. 979–982, figs. 5*).—The main features of the principal processes which have been used in the manufacture of this material are briefly described.

The actual state of the nitrate of lime industry in Norway (*Rev. Sci. [Paris], 5. ser., 9 (1908), No. 17, pp. 532, 533*).—Data are given as to the extent to which Norwegian water power is being utilized in the manufacture of basic lime nitrate.

Phosphates, R. McMurtrie (*Amer. Fert., 28 (1908), No. 6, pp. 8–13*).—This is a summary of information regarding the classification, mining, and handling of mineral phosphates, the preparation of superphosphates, and the relative fertilizing value of mineral phosphates, superphosphates, reverted phosphates, and phosphatic slag.

Tunisian phosphates, E. Bertainchand (*Bul. Dir. Agr. Com. et Colon. [Tunis], 12 (1908), No. 46, pp. 55–81; Bul. Agr. Algérie et Tunisie, 14 (1908), Nos. 9, pp. 225–232; 10, pp. 254–265*).—The phosphate deposits of Tunis which have been developed up to the present time are described, with analyses of samples of the various phosphates. It is stated that the exportation of these phosphates in 1907 amounted to 1,058,700 tons, derived from four different deposits. It is estimated that the exportations during 1908 will be considerably larger.

Attention is called to the fact that Tunisian soils are generally naturally deficient in phosphates and are further impoverished by the growth and export of products which exhaust the phosphate supply of the soil. The more extended and systematic use of phosphates in Tunis is therefore recommended.

The chemical methods used in examining the phosphates are briefly described.

[Phosphate deposits in Tahiti] (*Mark Lane Express, 98 (1908), No. 4001, p. 645*).—The British consul at Tahiti reports the discovery on the Society Islands "of enormous deposits of phosphate of lime of an extremely rich character. It is estimated that on one island alone there are at least 30,000,000 tons of the material, the analysis of which has shown from 65 to 85, and even 90 per cent of pure phosphate of lime."

Increased production of phosphate rock in 1907 (*Tradesman, 59 (1908), No. 9, pp. 918, 919*).—It is stated that "the production of phosphate rock in the United States in 1907 amounted to 2,265,343 long tons, valued at $10,653,558, an increase over the production of 1906 of 184,386 long tons in quantity and of

$2,074,121 in value. The average price per ton in 1907—$4.70—was 58 cents greater than in 1906, an increase of 14 per cent." The production from Florida was greater than in any previous year of the history of the phosphate industry. There was also a large increase in the production from South Carolina and Tennessee.

Potash in granitic soils, J. del Campo (*Prog. Agr. y Pecuario, 14 (1908), No. 374, pp. 197–200, figs. 2*).—In this article data are presented to show that although granitic soils contain considerable percentages of potash they are often benefited by applications of potash fertilizers, thus indicating that the potash of feldspar, the characteristic potassic constituent of granite, is rendered available in the soil very slowly.

On the utilization of leucite, C. Manuelli (*Gaz. Chim. Ital., 38 (1908), I, No. 2, pp. 143–152; abs. in Chem. Zentbl., 1908, I, No. 22, p. 1945*).—Comparative tests of various technical processes for obtaining potash salts from leucite are reported. Heating a mixture of the leucite with powdered charcoal and alum to a dull red glow for one-half hour and extracting with boiling water and steam gave good results in the author's experiments.

The industrial treatment of leucite and leucitic materials, G. Gallo (*Rend. Soc. Chim. Roma, 6 (1908), No. 1, pp. 29, 30*).—A process of treating the materials for the recovery of the potash in an electric furnace with dry chlorin gas is briefly described.

The potash industry (*Saaten, Dünger u. Futtermarkt, 1908, No. 24, pp. 651–658*).—The present status of this industry is reviewed.

[Fertilizers in connection with the beet-sugar industry] (*Sugar Beet, 29 (1908), No. 1, pp. 23–26*).—Brief notes are given on the utilization of the nitrogen of distillers' wash, the transformation in the soil of lime nitrogen, filter press scums as fertilizers, the increased yield of beets due to stimulants such as potassium iodid and sodium fluorid, and the fertilizer consumption of mother beets.

Fertilizer experiments with sulphur water, H. E. Müller and K. Störmer (*Deut. Landw. Presse, 35 (1908), No. 34, p. 369*).—This material, which is an ammoniacal liquor obtained as a by-product in the manufacture of paraffin by the destructive distillation of coal, and is very similar in composition and general character to ordinary gashouse liquor, was used with good results on sandy and sandy loam soils. On cultivated soil it should be applied about 14 days before planting. As a top-dressing it should be applied not earlier than 4 weeks after the plants begin growth. On well-drained meadows it may be applied at frequent intervals to an aggregate amount of 160 gal. per acre annually.

Fertilizer analyses, A. J. Patten, S. L. Jodidi, and C. B. Collingwood (*Michigan Sta. Bul. 252, pp. 3–32*).—This is a report in the usual form of the results of the inspection of 275 samples of fertilizers collected during the months of April, May, and June, 1908.

Analyses of fertilizers—fall season, 1907, B. W. Kilgore (*Bul. N. C. Dept. Agr., 29 (1908), No. 3, pp. 51*).—The analyses here reported are of samples collected by the fertilizer inspectors of the State department of agriculture during the fall of 1907. A list is given of brands of fertilizers registered for sale in 1908.

Analyses of fertilizers—spring season, 1908, B. W. Kilgore (*Bul. N. C. Dept. Agr., 29 (1908), No. 4, pp. 50*).—The analyses here reported are of samples collected by the fertilizer inspectors of the State department of agriculture during the spring of 1908. A list is given of brands of fertilizers registered for sale in 1908.

Analyses of commercial fertilizers, W. Frear (*Penn. Dept. Agr. Bul. 163, pp. 51*).—This is a report of inspection of fertilizers in the State from August 1

to December 31, 1907, and includes analyses of 468 samples of fertilizing materials.

Commercial fertilizers and poisonous insecticides in 1907–8, G. S. FRAPS (*Texas Sta. Bul. 107, pp. 5–16*).—Analyses and valuations of fertilizers examined during the season are given in this bulletin, with brief statements regarding the amount of fertilizers sold in the State and their average value per ton, and the general provisions of the State fertilizer law.

It is reported that 21,850 tons of commercial fertilizers, exclusive of cottonseed meal, was sold in the State from September 1, 1907, to May 1, 1908. The average differences between selling price and valuation were $4 per ton in case of acid phosphate, $8 in case of kainit, $20 in case of sulphate and muriate of potash, and $7 in case of mixed fertilizers.

A list of insecticides registered under the State law during the year ended April 30, 1908, is given.

Standard fertilizers, 1908, A. MCGILL (*Lab. Inland Rev. Dept. [Canada] Bul. 151, pp. 27*).—This bulletin reports the results of analyses of 199 samples of fertilizers registered for sale in Canada in 1908.

AGRICULTURAL BOTANY.

Mushrooms, edible and otherwise, M. E. HARD (*Columbus, Ohio, 1908, pp. XII+609, figs. 504*).—This is a popular guide to the study of mushrooms, about 800 species being described and many illustrated by half-tone prints. The aim of the author in preparing this book has been "to describe the species, as far as possible, in terms that will be readily understood by the general reader; and it is hoped that the large number of illustrations will make the book helpful to those who are anxious to become acquainted with a part of botany so little studied in our schools and colleges."

Notes are given regarding the habitat and time of growth of the different species and also on their edibility. Chapters are included giving directions for cooking mushrooms and on how to grow them.

The yeast fungi, F. G. KOHL (*Die Hefepilze. Leipsic, 1908, pp. VIII+343, pls. 8, figs. 59*).—This is a study on the organization, physiology, biology, systematic classification, importance, and bearing on fermentation of yeasts and yeast-like fungi. Among the yeast-like fungi, the author includes the Schizosaccharomycetes and such genera of fungi as Torula, Mycoderma, Monilia, Oïdium, Dematium, etc.

Acclimatization of plants, H. F. MACMILLAN (*Circs. and Agr. Jour. Roy. Bot. Gard. Ceylon, 4 (1908), No. 9, pp. 55–73*).—In a paper read before the Ceylon Agricultural Society, the author gives an account of what has been done in Ceylon in the acclimatization of plants, and calls attention to the necessity for care in the introduction of plants, as it is usually the most worthless ones that are generally most readily acclimatized. Lists are given of plants which have been introduced into Ceylon from other parts of the world, showing the dates of introduction, so far as known, and the elevation or district best suited to their growth.

On the effect of a partial removal of roots and leaves upon the development of flowers, M. SHIGA (*Jour. Col. Sci., Imp. Univ. Tokyo, 23 (1907), Art. 4, pp. 15*).—The author carried on a series of experiments with peas of different kinds, horse beans, Japanese morning glories and buckwheat in water and pot cultures to determine whether a partial removal of leaves, roots, etc., has any effect upon the formation of flowers.

When the main root and most of the lateral roots were removed, flowering was promoted, except with buckwheat. When all the lateral roots were

successively removed, flowering was prevented, and the leaves and stems became smaller than in the control experiments.

When the removal of the lateral roots was done at intervals of 4 days for a month and after that once a week, the growth of the leaves and stems was not affected, and flowering was promoted. The removal of lateral roots once every week for the first month and once every 2 weeks during the second month resulted in the advance of flowering, but the total number of flowers was not increased.

When the lateral roots were removed, the main root was always greatly lengthened, while the stems of the plants were shorter than in the control. When the main root was removed, leaving a few lateral roots, the stems were not affected.

In the morning glories, peas, and horse beans, the removal of the main root and some of the lateral roots, leaving only a few laterals, caused the flowers to appear earlier than usual and more abundantly. When all the lateral roots were removed, some varieties of peas and the horse beans bloomed earlier, but others were so injured that blooming was not accelerated.

Where the leaves were removed in the morning glory and buckwheat, the plants failed to flower. In the peas, blooming was not promoted, but the bracts seemed to serve as assimilatory organs.

Rapid transformation of starch into sucrose during the ripening of some tropical fruits, H. C. P. Geerligs (*Internat. Sugar Jour., 10 (1908), No. 116, pp. 372–380*).—On account of the fact that many tropical fruits are as a rule gathered in a green and immature state and allowed to ripen afterwards, the ripening process taking place so rapidly that within a few days they become tender and well-flavored, they are said to offer a good opportunity for studying the somewhat obscure problem of the after-ripening of fruits. Investigations were carried on by the author with bananas, mangoes, tamarinds, and sapodillas to determine the changes taking place during ripening after being removed from the plant. A considerable amount of carbon dioxid was given off during this period of after-ripening and important chemical changes were shown to have taken place.

In the case of the banana the starch is rather suddenly transformed into sucrose, and during this process a little dextrin is formed. In the ripe fruits the sucrose becomes partly inverted or consumed as such or as products of its inversion.

With the mango, during the process of ripening yellow coloring matter is produced that resembles in every respect carrotin. During the after-ripening the starch is transformed into sucrose, which later on becomes hydrolyzed and splits up into glucose and fructose. The citric acid present in the fruit is vigorously attacked, and the decrease in the acid taste is not due to an increase in sugar content, nor to the neutralization of the acid, but to the destruction of the citric acid itself.

In the ripening of the tamarinds, the starch is transformed into sugar, but in this case it is not changed into sucrose, but into a mixture of glucose and fructose. The increase in the percentage of sugar after the period of maturity is due to the strong concentration by evaporation, as there is no fresh formation of sugar possible in so dry a fruit.

In the sapodilla the most important change is not due to the saccharification of starch, but to the changes brought about in the tannin and gutta-percha. The amount of sugar before and after ripening is the same, but the fruit becomes palatable by the softening of the hard pectin and by the deposit of tannin and gutta-percha in an insoluble form.

While studying the ripening of the fruits, the author found a rather sudden transformation of starch into sucrose, followed in a later stage by inversion

and partial degradation of the products of inversion. When the fruits were placed in nitrogen and air, it was found that after-ripening in the air proceeded uninterruptedly, while fruits kept in nitrogen remained unchanged and preserved their starch content. This indicates that a free access of oxygen is indispensable for the saccharification of the starch in the fruit.

In studying the cause of the transformation in the case of the mango, it was found that the juice contained a diastatic body with power to transform starch into dextrin and into sugar.

Further investigations showed that the rapid transformation of starch into sucrose during the after-ripening of some fruits is a vital process and not a consequence of the presence of some ferment contained in the fruit.

The hydrolytic and catalytic ferments acting during the process of ripening of fruit, G. Tallarico (*Arch. Farmacol. Sper. e Sci. Aff.*, 7 (*1908*), *Nos. 1, pp. 27–48; 2, pp. 49–68; abs. in Chem. Zentbl., 1908, 1, No. 16, pp. 1563, 1564; Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 724*).—The author made a study of bananas to determine the changes taking place during the process of ripening of the fruit. "From this fruit, gathered in different stages of ripening, extracts were made. The catalytic action was determined by investigating the action of the extract on hydrogen peroxid; the amolytic, by its action on starch; the proteolytic, by the action on gelatin; and the inverting, by the action on sucrose. The following enzyms were present: Catalase, invertase, amylase, tyrosinase, and a proteolytic enzym. The catalytic action is very intense so long as the fruit is green and during ripening; it weakens as the fruit gets black. The amylolytic action takes place when the fruit is green or at the beginning of the stage of ripening; it then disappears. The inverting action is almost entirely absent during the green stage, is intense during ripening, and then gradualy disappears. The proteolytic action manifests itself during ripening, and then probably gets weaker."

Transitory presence of hydrogen cyanid in ferns, M. Greshoff (*Pharm. Weekbl., 45 (1908), No. 26, pp. 770–773; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 725*).—The author reports the detection of hydrocyanic acid in ferns, such as *Gymnogramme aurea*, *G. lastrea*, and *G. athyrium*. The percentage varied from 0.056 in very young fronds to 0.006 in old ones, the content always diminishing with the increase in age of the material examined.

On the effects of certain poisonous gases on plants, W. J. V. Osterhout (*Univ. Cal. Pubs., Bot., 3 (1908), No. 4, pp. 339, 340*).—The author has carried on some experiments to determine a method of distinguishing the effect on plants of smelter fumes and other poisonous gases from that of drought and similar natural causes.

In some experiments on transpiration carried on some time ago, it was noticed that in the case of drought the oldest leaves were the first to succumb, while the youngest held out until the last. This was repeatedly confirmed with cultures of the common wandering jew.

When the problem of smelter fumes was called to his attention, it occurred to the author that probably the effect of poisonous gases would be the reverse of that of drought, in that the younger leaves would be affected before the older ones. Experiments with wandering jew showed that the young leaves were the first to be killed by sulphur dioxid, and these were afterwards confirmed by experiments on fruit trees, grapevines, and other plants. Field observations have since borne out the results of the experiments.

It is believed possible, therefore, to distinguish between the effects of poisonous fumes and natural agencies, such as drought and injury to the roots, in a clear and definite manner.

International catalogue of scientific literature. M—Botany (*Internat. Cat. Sci. Lit., 5 (1908), pp. VIII+1210*).—This is the fifth annual issue of the catalogue of scientific papers compiled and published by the International Council of the Royal Society of England, the arrangement and grouping being essentially the same as in previous issues (E. S. R., 18, p. 435). The number of papers noted is about 7,000, the literature included being mainly that of 1905. As in the previous numbers, the American literature is inadequately catalogued, the publications of this Department and the experiment stations being almost wholly neglected. In the section listing titles realting to the treatment of plant diseases, not a single reference to American literature is given.

FIELD CROPS.

The rotation of crops, W. M. Hays et al. (*Minnesota Sta. Bul. 109, pp. 281–358, figs. 12*).—The plan of this experiment, together with earlier results, has been previously noted (E. S. R., 7, p. 122). This bulletin reports the results of 10 years' work.

Of the different cropping systems tried those in which corn, small grains, and timothy and clover for 1 to 4 years were arranged in a 4 to a 7 year rotation with light manuring once during the course, gave large net profits. The standard 5-year rotation was as follows: First year corn following the application of 8 tons of manure per acre, second year wheat, third and fourth years meadow, and fifth year oats. The average gross income per year from this rotation based on average farm prices was $14.08 per acre and the cost of production, including $3.50 land rental, was $9.05. The best rotations yielded a product worth from $4 to $6 per acre more than is obtained on the average farm throughout Minnesota. All systems of cropping which provided for the maintenance of vegetable matter in the soil either by manuring or by growing pasture or meadow crops gave profitable returns.

The plats growing hoed crops such as corn, potatoes, and mangels continuously without manure gave poorer returns than the plats growing grain continuously without manure. It is believed that the intertillage given these crops caused a more rapid depletion of vegetable matter than took place in the continued grain fields. The 4-year rotation, millet, barley, corn, and oats, gave no better returns than wheat grown continuously. All these crops are considered exhaustive as they decrease rather than increase the supply of vegetable matter in the soil. Sowing grass seed with grain on corn land that is disked in the spring, in place of fall plowing, proved to be the surest method of obtaining a grass stand at the university farm.

In studying the influence of crop rotation and continuous cultivation upon the composition and fertility of soils at the beginning and close of the 10-year period on the 44 experimental plats, it was found that when wheat, corn, potatoes, and mangels were grown continuously the average loss of nitrogen amounted to 0.034 per cent, or 1,100 lbs. per acre. The maximum amount of nitrogen was lost in the continuous cultivation of these crops. In the case of wheat two-thirds of the nitrogen removed was not utilized as plant food but was lost by the rapid decay of the humus with the formation of soluble and volatile nitrogen compounds. When the crops were grown continuously the soils lost 0.5 per cent of carbon, representing over 1 per cent of humus or 20,000 lbs., equivalent to an annual loss of 1 ton per acre. On the plats growing the standard rotations there was an average gain of 0.014 per cent of nitrogen, equivalent to about 300 lbs. per acre. The results show that the nitrogen content is maintained when clover is grown 2 years in a 5-course rotation. The data also indicate that any substitution of crops in the rotation could be made without mate-

rially affecting the nitrogen content of the soil, provided clover was retained. Rotation maintained the carbon and humus content of the soil and in some cases slightly increased it. The substitution of timothy and other nonleguminous plants for clover caused a loss of nitrogen, but the carbon and humus content was kept up. The conservation of the humus prevented rapid nitrification and the loss of soil nitrogen only slightly exceeded that removed by the crops.

The potash compounds of the soil were less soluble at the close of the 10-year period than at the beginning. The formation of soluble potash compounds did not keep pace with the amount removed as plant food and that lost in the drain waters.

Report of the work at the Holly Springs Station for 1907, C. T. AMES (*Mississippi Sta. Bul. 110, pp. 7*).—This bulletin reports briefly the results of fertilizer experiments on cotton, corn, and cowpeas, with notes on grasses and forage crops.

The work of the San Antonio experiment farm in 1907, F. B. HEADLEY and S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 13, pp. 3–16*).—This circular contains a description of the farm and the lines of work undertaken.

In experiments with cotton and corn in 1907, 4 plats plowed and subsoiled to a depth of 12 in. or more yielded more in every case than an equal number of plats not subsoiled. In October, 1907, part of a field of sorghum was plowed and the other part left unplowed until December. In the meantime, 7 in. of rain fell and soil moisture determinations made in December showed 24.9 per cent of water in the first 3 ft. of the land plowed in October, as compared with 22.6 per cent for the land plowed in December, or a difference equivalent to 1.1 in. of rain.

It is pointed out that on the heavy soil of San Antonio a light rain of 0.1 to 0.4 in. may reduce rather than increase the total amount of soil water. Soil moisture determinations were made in an orchard and a cornfield cultivated on June 5 and 6, 1907, respectively, to illustrate the effect of early tillage after rain. On May 29, 1.2 in. of rain fell and 7 days after, in the absence of a dust mulch, the moisture content of the first 3 ft. in the orchard was 0.6 per cent less than it had been before the rain. In the near-by cornfield, which was cultivated 2 days earlier, an increase of 0.6 per cent of moisture over what was in the soil May 28 was determined.

Soil moisture determinations were also made on March 12, 1908, on two fields, one of which was fall plowed and well tilled throughout the winter and the other plowed in February. The upper foot of soil of the winter tilled plat retained 3.4 per cent more moisture than the plat left without cultivation until February.

Two methods of eradicating Johnson grass were tried. In September, 1906, a 6-acre Johnson grass meadow was plowed 4 to 5 in. deep with a disk plow. Two acres were left fallow during the winter, cultivation was given during February, March, and April at a cost of $10.84 per acre and in May, when the eradication was nearly complete, the field was sown to German millet. The other 4 acres were sown to oats in November. The growth of Johnson grass in the spring in this field was weak and but few plants headed out before harvesting early in May. The cost of cultivation to eradicate Johnson grass after plowing was only $1.12 per acre.

In 1907 a field of sorghum sown broadcast yielded 1.68 tons per acre, while the same variety drilled in rows 4 ft. apart in an adjoining plat yielded at the rate of 2.9 tons of cured fodder. A plat of 1.28 acres planted in alfalfa varieties in double-drilled rows 2 ft. apart to permit cultivation survived the severe drought of the summer of 1907 and in March, 1908, yielded from the first cutting 1,236 lbs. of cured hay from the field, equivalent to 957 lbs. per acre. Ad-

jacent plats sown in drills 6 in. apart yielded at the rate of only 318 lbs. per acre.

Notes on work with cotton, crops for forage, green manure and grain, and on horticultural work are given and the sterility of sorghum due to the activities of *Diplosis sorghicola* is described.

Change of vegetation on the south Texas prairies, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 14, pp. 7*).—Attention is called to the fact that regions formerly grassy, open prairies are now covered with a dense growth of mesquite, prickly-pear cactus, and other shrubby plants of intermediate size. The influence of fires on the change of vegetation is discussed. It is stated that mesquite alone works little injury to the grazing industry, but that the huisach (*Acacia farnesiana*), and smaller shrubs and cacti may become numerous enough to kill out the grass and diminish the pasturage rapidly. It is believed that the shrubby vegetation in south Texas will continue to advance and multiply wherever the land is not cleared and cultivated. The mesquites, cacti, chaparral, and sagebrush are considered by the author only as an episode of the bionomic history of the region and not as its original or normal condition or an index to its agricultural possibility. It is believed that they are merely the forerunners of a larger forest growth.

Dry-land agriculture (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 130, pp 7–90, figs. 4*).—This bulletin contains the following papers, read at the second annual meeting of the cooperative experiment association of the Great Plains area, held at Manhattan, Kans., June 26–27, 1907: The Development of Dry-land Farming, by E. A. Burnett; Some Soil Studies in Dry-land Regions, by F. J. Alway; Crop Production under Humid and Dry Conditions, by E. G. Montgomery; Blowing Soils, by L. E. Hazen; Plant Breeding in Conjunction with Dry-land Agriculture, by L. R. Waldron; Rate of Sowing Durum Wheat, by L. R. Waldron; Fruit Growing on the Plains, by J. E. Payne; Oklahoma Rotations and their Relation to Soil Culture Work, by L. A. Moorhouse; and Dry-land Plant Breeding, by J. H. Shepperd.

Dry-land grains, W. M. Jardine (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 12, pp. 3–14*).—An address delivered at the Trans-Missouri Dry-Farming Congress at Salt Lake City, Utah, January 23, 1908.

The different grains adapted to dry-land culture are enumerated, and the great wheat groups, hard spring, hard winter, semisoft white, and soft white wheats are discussed. The hulless types of barley, Tennessee Winter barley, and Sixty Day, Kherson, Burt, and Swedish Select oats are considered promising for dry-land conditions, and the grain sorghums, milo maize, black hull Kafir corn, and red Kafir corn are recommended as valuable for the arid region.

The regions where the different wheat groups are grown under dry farming are pointed out. The durum wheats have proved themselves drought-resistant and rust-resistant, and it is believed that they will ultimately become the leading spring type in dry-land agriculture. It is stated that the durum wheat crop of 1907 exceeded 50,000,000 bu. The hard winter or Crimean group of wheats has shown a wide adaptability and excellent drought resistance. It is thought that the only possible way to obtain a steady and permanent market for grains, especially in the intermountain area, is to concentrate on as few varieties as possible.

Alfalfa (*Kansas Sta. Bul. 155, pp. 183–345, figs. 60*).—This bulletin consists of the following series of papers on alfalfa: History and varieties, alfalfa breeding, and diseases of alfalfa by G. F. Freeman; the seeding of alfalfa, management of alfalfa in the field, the alfalfa seed crop, alfalfa hay—its making, handling and marketing, and handling and treating alfalfa land by A. M. Ten Eyck; the adulterants, substitutes and impurities of alfalfa seed and their

detection by H. F. Roberts; the relation of bacteria to alfalfa by W. E. King; the composition and digestibility of alfalfa and its relation to soil fertility by J. T. Willard; alfalfa feeding by R. J. Kinzer and G. C. Wheeler; alfalfa for a dairy farm by J. C. Kendall; and insects and other animals injurious to alfalfa by T. J. Headlee. In these papers the history, culture, improvement, and uses of alfalfa are discussed. The Turkestan, German, American, Arabian, and Peruvian types are noted, the inoculation of soils for alfalfa culture described, and the composition and digestibility of alfalfa considered. The uses of alfalfa for the different kinds of live stock are pointed out, and the methods of improving the plant by breeding and selection are discussed. A number of the papers report experimental results.

On June 18, 1903, 1,133 alfalfa plants were counted in a plat seeded the fall before and containing 100 sq. ft. On June 29, 1906, this field showed only 670 plants and on August 9, 1907, 403 plants. The decrease in the number of plants during a period of 50 months was 730, or a loss of 64.4 per cent. Another plat seeded in the spring of 1904 contained 1,130 plants on June 20, on an area of 5 ft. square. May 1, 1905, the number of plants had been reduced to 403, and May 25, 1908, to 148 plants. Only 13 per cent of the plants counted in the original seeding survived 4 years after seeding. Although the number of plants was greatly reduced in these plats the stand of alfalfa was apparently as good as ever, because the plants which remained increased in size and sent out more shoots or stems.

Disking alfalfa with the common disk harrow in 1903, 1904, and 1905, gave an average yield of 9,922 lbs. of cured hay, as compared with 10,269 lbs. where no disking was done. An experiment in manuring alfalfa at the rate of about 10 tons of well-rotted barnyard manure per acre, applied to the winter wheat crop immediately preceding the alfalfa, produced 63.7 plants per square foot averaging 13 in. high, while on similar land not manured 50.4 plants, 4½ in. high were produced per square foot.

In germination tests at the station the average germination from brown, blackened, and green immature seed in 21 samples was 65 per cent, the range lying between 39 and 80 per cent. The average germination of 5 high grade samples was 98 per cent. The apparently bad seed from these high grade samples gave an average germination of 70 per cent, while an average from 4 low grade samples gave a germination of 75 per cent and 46 per cent for the whole sample and for the apparently bad seed, respectively. In one sample the dead and defective seed reached 60 per cent of the total, from 5 to 10 per cent being very common in the samples under test. One of the best samples analyzed 95.6 per cent pure, while a germination test showed but 63.9 per cent of pure good alfalfa seed, the impurities amounting to 36.1 per cent and consisting of dead and decayed seed 28.1 per cent, foreign seed 7.1, and inert matter 0.9. Attention is called to the fact that a pound of this sample would have contained 135,053 good alfalfa seed capable of germination, 59,389 dead and defective alfalfa seed incapable of germinating, and 20,593 foreign seeds.

In studying the analyses of alfalfa seed made at the station it was found that about 97 per cent contained from zero to 10 per cent of both inert matter and foreign seed. While 60 per cent of the samples analyzed contained from zero to 10 per cent of foreign seed, 50 per cent of these samples contained from zero to 10 per cent of inert matter. In 35.2 per cent of the samples subjected to analysis the seed failing to germinate ranged from 15 to 25 per cent, and a germination percentage of not more than 64 was found in 30 per cent of the total number of samples, while the mean germination percentage of all of the 253 samples was 75.4 per cent. A table is given showing that with the poorest 10 samples the cost of seeding 1 acre ranged from $3.75 to $34, while the cost

of seeding 1 acre with the best 10 samples ranged from $1.95 to $2.10. A comparison of the results of analyses during the years 1906, 1907, and 1908 shows practically no improvement in the total impurities present in the seed, but the percentage of foreign seed shows a gradual decline.

Cutting alfalfa at different stages of maturity gave the following yields at the first cutting: First bloom, May 16, 1.36 tons of hay, one-tenth bloom, May 29, 1.76 tons, one-half bloom, May 31, 1.81 tons, and at full bloom, June 7, 2.04 tons per acre.

In 1902, A. L. Cottrell found that 223 plants examined contained 6,335 stems, or an average of 28.4 stems per plant. On the average 55 per cent by weight of matured hay was found to be stems and 45 per cent leaves. This relation showed some variations, however, as one group selected for leaf characteristics had 49 per cent leaves and 51 per cent stems, while another selected for stem characteristics contained 41 per cent leaves and 59 per cent stems.

In 1905 the station hauled green alfalfa hay into a small shed above an elevated, well-ventilated bottom, the hay being piled loosely from 4 to 5 ft. thick but not tramped. A second cutting was later placed upon the first in a similar manner. While alfalfa left in the field was very badly spoiled by the rains, this green alfalfa cured out almost perfectly, showing only a little moldy hay in the center of the mow. Directions and plans for the construction of hay sheds adapted to this method of curing and storing alfalfa hay are given.

As an average for 4 seasons the yields per acre of several hay crops compared as follows: Common alfalfa 7,345 lbs., Turkestan alfalfa 6,080 lbs., Medium Red clover 5,490 lbs., *Bromus inermis* and alfalfa 5,473 lbs., timothy 4,779 lbs., timothy and red clover 4,604 lbs., Mammoth clover 4,148 lbs., *B. inermis* and red clover 4,133 lbs., *B. inermis*, orchard grass and red clover 3,825 lbs., timothy, red clover and *B. inermis* 3,560 lbs., timothy and redtop 3,060 lbs., *B. inermis* 2,892 lbs., tall oat grass 1,707 lbs., meadow fescue (English bluegrass) 1,666 lbs., orchard grass 1,414 lbs.

Moisture determinations of green alfalfa cut at different stages of maturity in 1906 showed the following total moisture content: Cut at the time of first bloom, May 16, 74.64 per cent, cut at one-half bloom, May 31, 69.72 per cent, and cut in full bloom, June 7, 64.18 per cent. Other determinations showed a moisture content ranging above 80 per cent.

Winter bur clover, W. C. Welborn (*Texas Sta. Bul. 108, pp. 3–6*).—The culture and uses of bur clover are described.

Cotton experiments, 1907, W. R. Perkins (*Mississippi Sta. Bul. 113, pp. 7, chart 1*).—In comparison of 11 varieties of cotton, Cleveland Big Boll ranked first in lint production with 630 lbs. per acre and first in total value per acre with $69.73. Russell Big Boll ranked first in seed production with 1,280 lbs. of seed per acre. Russell Big Boll and World Wonder produced the longest staple, 1⅛ in. Topping cotton on August 3 and 26 gave inconclusive results. Cotton plowed the last time on August 3 did not keep up its growth as late nor was the number of late blossoms nearly so large as in cotton cultivated twice later than this date, on August 13 and 27. The plat cultivated last on August 3 yielded 1,126 lbs. of seed cotton, while the plat cultivated last on August 27 yielded 1,236 lbs. per acre.

Breeding work with cotton is briefly described. The work was begun in 1904 with a few selected stocks of Cook Improved, but although selection has been carefully continued considerable variation is still found.

Danger in judging cotton varieties by lint percentages, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 11, pp. 3–16*).—This circular points out the danger of too persistently basing the selection of cotton upon the single character of lint percentages, shows how smaller or lighter seeds raise the lint

percentage, describes the advantage of large seeds, heavy seeds and large-seeded varieties, and calls attention to the higher lint percentages that diminish fertility, to the large yields without high percentages, and to the high quality with low percentages.

It is shown that smaller or lighter seeds increase the percentages of lint quite as effectively as an additional amount of fiber. A Mexican cotton with 27 per cent of lint hybridized by Egyptian cotton having a somewhat higher percentage gave a progeny with a percentage of only 22.9, while the lint increased from 4.05 gm. to 4.45 gm. per 100 seeds. The seeds, however, increased from 10.95 to 14.75 gm. per 100 seeds. In order that a higher lint percentage may be accompanied by an increased amount of lint it is necessary that the weight of the seeds does not decline either by reduction in size or by change of texture or compactness.

The size of the seed is of practical importance apart from the question of lint, mainly for the reason that there is an increased demand for cotton seed for oil and other uses and that the presence of the boll weevil gives large seeds a definite advantage. The large seed as a rule gives the young plant a better start than a small seed and the more vigorous the seedlings the earlier the varieties should be. It is shown that some of the early varieties like the King, which has small seeds, small bolls, and short lint, may afford no better protection against the weevils than some of the large-seeded big-boll varieties. Early opening of the bolls is not considered the best index of the amount of protection obtained by early development. As long as the bolls are matured they are beyond the reach of weevil injury and a variety setting bolls early and carrying them past the danger of weevil infection may produce a larger crop in the presence of the weevils than the variety which ripens the first bolls. "The ideal habit of earliness would be met by a variety which could develop a large number of bolls past the point of weevil injury early in the season. Delay in the date of opening might be an advantage if all the bolls would open together and thus avoid the need of making several pickings of the same field." Other advantages of big-boll over small-boll varieties are pointed out.

The author states that lint percentages can not be substituted for actual tests of yield and that selection by lint percentages instead of increasing the agricultural value of a variety may actually diminish it. On the other hand, it is shown that large yields may be secured without high percentages. No necessary connection between lint percentages and yields seems to exist, as very high yields are obtained from varieties with relatively low percentages of lint. It is pointed out that in Sea Island and Egyptian cottons the percentages fall below those reached in some of our Upland varieties, but that high yields are not prevented by lower percentages of lint. "Other things being equal, the high percentage varieties would always yield more lint, but it is evident that the other things are often unequal and that the high percentages have no fixed connection with vigor and fertility. Lint percentage is important as long as the other features are not left out of account, but persistent selection for lint percentage alone would be as likely to reduce the crop as to increase it." High lint percentages are not considered as insuring high yields or high quality. With greater length the percentage falls rapidly as the lint of carefully selected varieties becomes longer.

In discussing the true standard of yield in cotton the author points out that the most direct indication of productiveness is not the proportion between the lint and the seed but the proportion of the lint to the plant as a whole. A comparison of the weight of the lint with the weight of the plant would determine how much in the way of other tissues the plant has formed in producing a given

amount of lint. It is proposed that a lint index in the weight of the lint itself instead of a less important proportion between the lint and the seeds be used for judging varieties. "The lint from 100 seeds of Upland cottons ranges in weight from 6 gm. or less to 9 gm. and upward, and these figures can be directly applied as a standard in judging varieties in place of the lint percentages." A lint index on this basis would mean something actually accomplished, and an unintentional discrimination between small seeds and small bolls would be avoided.

The relation between large seeds and large amounts of lint, or a high lint index, was tested by D. N. Shoemaker by a study of weights of 73 samples of seeds and lint in a series of selections of Triumph cotton, and the results are here briefly noted. The average weight of 100 seeds was 12.37 gm., and their average weight of lint 7.38 gm. Of 44 plants whose lint was above the average only 4 fell below the average in weight of seed, and of 29 plants which fell below the average in weight of lint only 4 were above the average in weight of seed, and these exceeded the average only a little. No such evidence of correlation was found when the same data were arranged according to size of seed and percentage of lint. Of the 28 plants showing lint percentages above the average of 37.7, 15 had seeds below the average weight while the other 13 had seeds above the average. The author points out that the selection of a plant with the highest percentage of lint, which was 42.8, would have meant the rejection of no less than 41 plants whose seeds produced larger amounts of lint; that is, the plant with the highest percentage would have ranked as No. 42 in the series of 73 plants if arranged by lint indexes. The plant with the highest percentage of lint had only seven-eighths as much lint as the plant showing the highest lint index, and this is used as an illustration to indicate the extent of the practical difference in this variety between the lint index and the lint percentage as the basis of selection.

Progress of the beet-sugar industry in the United States in 1907 (*U. S. Dept. Agr. Rpt. 86, pp. 7–88*).—As in previous reports a general review of the beet-sugar industry is given for the year 1907, by C. F. Saylor, together with discussions with reference to the influence of the beet-sugar industry, the costs and profits of sugar beet growing, the use and value of by-products, the labor problem and labor-saving devices, and the development of conditions and prospects for extending the beet-sugar industry in the different States, with statistics of sugar production in this country and the world at large.

In 1907, 63 factories were in operation, 370,984 acres of beets were harvested, 3,767,871 tons of beets were worked into 463,628 tons of sugar, the average sugar content of the beets was 15.8 per cent, the average purity coefficient 83.6 per cent, and the estimated abstraction of sugar 12.30 per cent. The average yield of beets was 10.16 tons per acre, exceeded only in 1904 and 1906, and being 5 per cent greater than the 6-year average for 1901–1906. The average length of the campaign was 89 days.

The work of the Bureau of Plant Industry with sugar beets is briefly outlined by B. T. Galloway.

Sugar beets in Virginia. W. B. Ellett (*Virginia Sta. Circ. 1, pp. 4, fig. 1*).—Culture tests with sugar beets in Virginia are briefly reported. The first experiments were conducted by this Department from 1897 to 1900, inclusive, and 132 samples analyzed contained an average of 10 per cent of sugar and a purity of 74 per cent. All but one of the samples were grown in Piedmont and Tidewater, Virginia.

The results of 3 years' experiments begun in 1900 by the Virginia Experiment Station in cooperation with this Department have been previously noted (E. S. R., 17, p. 549). The results of 1904 were a little better than the 3-year

average, the yield being 13.3 tons per acre, the sugar content 13.9 per cent, and the purity 81.2 per cent.

It is believed that equally good results may be secured throughout a large part of the Valley of Virginia, the southwestern part of the State, and possibly in some of the higher sections of Piedmont Virginia.

Varieties of cane, with special reference to nomenclature, N. Deerr and C. F. Eckart (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 26, pp. 5–25*).—This bulletin records results with reference to nomenclature of varieties of cane secured by a study of all the literature available, as well as the personal observations of the authors. An outline of the history of different varietal groups is presented, and synonyms of the varieties treated are given in a summary. The different varieties discussed are the Yellow Otaheite, Batavian or Transparent, Yellow Caledonia and Tanna, Salangore, Cavengerie, Bamboo, Red, Stripedtip, Elephant, Green Rose Ribbon, Uba, and Daniel Dupont canes.

Cooperative wheat variety work (*Ohio Sta. Circ. 84, pp. 4*).—This circular describes the object of the test and the methods to be followed by each cooperator in conducting the work.

HORTICULTURE.

Handbook of fruit culture, N. Gaucher (*Handbuch der Obstkultur. Berlin, 1908, 4. ed., rev. and enl., pp. XX+1030, pls. 16, figs. 630*).—This work, which is offered as a book of practical experience for practical use, first appeared in 1888, and has been considerably revised and enlarged in the succeeding editions. The first 2 parts deal with the development of the nursery and nursery practices. The succeeding parts of the work treat of the history, importance, and profit of fruit culture, with hints for further development of the industry; fruit culture in the field and on the roadside; planning fruit orchards and gardens; formal fruit gardens and their arrangement; the function of the leaves, purposes of pruning, and the physiological fundamentals of rational fruit culture; pruning methods; the care of artificial tree forms; harvesting, storing, and packing; diseases of fruit trees and shrubs; and the friends and enemies of fruit trees.

The text is fully illustrated, and a monthly working calendar, together with several plans for the development of formal fruit gardens and views of specimen fruit trees grown at the author's horticultural establishment at Stuttgart, are appended.

On the virgin fertility of fruit trees, A. Glatz (*Proskau. Obstbau Ztg., 13 (1908), No. 7, pp. 100–106*).—The occurrence is reported of an apple tree producing seedless fruit. The tree is said to be a heavy bearer and fruit buds are formed on the one-year wood, thus enabling the tree to bear annually. The flowers have neither petals nor stamens. Although the pistils have a weak development, they produce seed when artificially pollinated. The tree comes into full bloom before the leaves begin to develop, from which it appears that the fruit buds, unimpeded by the growing leaves, may be able to develop at the expense of the reserved food supply in the tree. The core development varies in the individual fruits, and in some is almost lacking.

The author is of the opinion that the method devised by Ewert (E. S. R., 19, p. 142) for artificially pollinating nonfertile varieties of fruits will be found to be of little value for practical orchard culture. He suggests that an attempt should be made by judicious breeding so to develop the existing seedless varieties, as to render the production of satisfactory fruit possible in years when the weather and other conditions are unfavorable for pollination.

The grape in the various stages of maturity. W. Kelhofer, trans. by E. Zardetti (*Gior. Vin. Ital., 34 (1908), No. 30, pp. 475–477*).—Tabulated results are given and discussed relative to the determination of the weight of seeds, density of the must, and content of sugar, acid, tannin, nitrogen, and ash in grapes at various stages previous to maturity. Nine determinations were made from August 24 to October 28, inclusive.

The sugar content increased from 0.77 per cent on the first date to 14.76 per cent on the latter date. There was a corresponding decrease in acidity from 31.7 per cent to 13.1 per cent, and of tannin from 0.88 per cent to 0.25 per cent.

On some experience in hybridizing grapes. C. Grimaldi (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), I, Nos. 10, pp. 653–661; 11, pp. 745–751*).—A list is given of 207 hybrid grapes originated by the author since 1889, together with a brief outline of the method of procedure, the results secured, and descriptions of several hybrids recommended for trial.

Viticultural notes, H. Blin (*Semaine Agr. [Paris], 27 (1908), No. 1394, pp. 44, 45*).—A study of the hybrid grape Portuguese Blue×*Rupestris phénomène du Lot* relative to its characters, qualities, and advantages.

Basing his conclusions on single observations as well as on practical tests in numerous situations, the author recommends this hybrid for planting in central France. It is said to be a very productive variety, resistant to cryptogamic maladies, and capable of adapting itself to various soils. The grapes are black, produce a highly colored wine rich in alcohol, and stand shipment well. The bunches are from 15 to 20 cm. long and weigh from 200 to 250 gm. The crop matures about the first of August. It is further claimed that this hybrid is remarkably resistant to frost.

The influence of grafting on the quality of wines in Anjou, Marquis de Dreux-Brézé (*Rev. Vit., 30 (1908), No. 760, pp. 29–32*).—In the course of reconstituting the vineyards in Anjou special attention was paid to the selection of vines suitable for heavy limy soils. A large number of experimental fields were planted in 1893 and 1894 with all of the prominent grape stocks of that time. These were later grafted to healthy scions of known origin. A summary is here given of the author's experience and observations, combined with those of several cooperators, relative to the influence of grafting and of the grape stock on the products of the vine.

Contrary to the opinion of J. Capus, who in the same line of investigation in the department of Gironde found that grafting does not appear to have produced anything new (E. S. R., 19, p. 739), the general conclusions reached from the present investigation are that, other conditions being equal, grafting augments the quality, grade, and value of Anjou wines. On the other hand, the grafted vines are more delicate and require more care. Grafting does not appear to interfere with the special characteristics of local wines. The grape stock, however, has a very great influence on the quality of the wine. White wines appear to be more affected than red wines. The stocks are classed in 3 groups, those which improve the quality, those which elevate it slightly, and those which modify it.

Bearing hybrids (grapes) and their wines in 1907, E. Pée-Laby (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), Nos. 23, pp. 687–689; 24, pp. 707–717; 25, pp. 753–755; 26, pp. 775–782*).—A committee report to the Central Society of Agriculture of Haute-Garonne relative to observations made in 1907 on the cultural value of the direct bearing grape hybrids, together with the results of an analytical study of wines obtained by making various mixtures of the wines of hybrids with the common wines of the country. The older hybrids in the experimental vineyards of the Montpellier agricultural school were studied to determine whether they had deteriorated in quality or not, and observations

were made in several other vineyards in the region. Notes are given on the various hybrids studied with special reference to their resistance to phylloxera and the affinity of hybrids grafted on various stocks.

Although the ideal hybrid direct bearer has not yet been secured, it is believed that progress is being made in this direction. Several hybrids have been found which produce a wine of the right flavor. While they show lack of affinity for the old grape stocks in many instances, it is thought that satisfactory stocks may be found among the Franco-American hybrids. After a lapse of 9 or 10 years some of the direct bearers are as productive and vigorous as those which are grafted, although they are not as yet recommended for general planting. The wines of certain hybrid bearers are found to improve the quality of the ordinary wines when judiciously employed. They increase the selling price of most of the common wines and give them a much richer color. It is also believed that the hybrids will furnish a good grade of wine for general consumption.

Statistics on grape and olive products for the year 1907 (*Estadística de las Producciones Viticola y Olivarera en el Año 1907. Madrid: Junta Agronómica, 1908, pp. 7*).—In this pamphlet tables are given showing the approximate production of grapes, wine, olives, and olive oil as reported by the directors of the Provincial Agronomic Service for the various regions and provinces in Spain.

The total estimated area of vineyards in the Spanish provinces is 1,367,455 hectares (about 3,378,000 acres). The total production of grapes was 3,171,566,500 kg. (about 3,489,000 tons), of which 2,898,222,100 kg. (3,188,000 tons) were converted into wine. The total production of wine was 18,384,337 hectoliters (about 484,346,500 gal.).

The total area devoted to olive culture is estimated at 1,353,196 hectares (about 3,344,000 acres), and the total olive crop was 1,608,361,300 kg. (about 1,769,200 tons), of which 1,534,459,900 kg. (about 1,688,000 tons) were used in the manufacture of olive oil. The total quantity of olive oil produced was 3,330,606 hectoliters (about 87,928,000 gal.).

Observations on the various forms of fig (Ficus carica). Leclerc du Sablon (*Rev. Gén. Bot., 20 (1908), Nos. 232, pp. 129–150, figs. 13; 233, pp. 207–216, figs. 2*).—A comparative study of the flower and fruit of *Ficus carica*, based upon the work of previous investigators as well as the author's personal observations.

All figs are classed according to the morphological characters of the flower under two general types, (1) the male figs, which have in their successive crops during the year female flowers with short styles adapted for symbiosis with the Blastophaga and which have in addition male flowers in the summer crop; (2) the female figs, which have only female flowers with long styles and which in some cases must be fertilized and in others need not be fertilized for the development of the fig. These two types are considered as the male and female flowers of a dicœcious species, and are further divided into 16 groups, according to the characters of the mature fig and the season of ripening. With certain varieties of female figs grown in France the autumn figs are found to mature either with or without fertilization. The fertilized figs contain seeds, are larger, more watery, and have a more pronounced flavor, but contain less sugar than the unfertilized figs. The latter contain no seeds.

A brief bibliography is appended.

Observations on change of sex in Carica papaya, M. J. Iorns (*Science, n. scr., 28 (1908), No. 708, pp. 125, 126*).—The author here reports for discussion the change of sex recently observed in some trees of *C. papaya*, brought about apparently by the removal of the terminal bud.

As found in Porto Rico this species is distinctly diœcious, the monœcious form being very rare. The change of sex in the first tree noted was brought about accidentally. A staminate tree having its terminal bud injured produced shortly afterwards pistillate as well as staminate flowers. The former flowers set and developed good-sized fruits, which bore all the characteristics of normal fruits except that they were not quite so well filled out. The seeds, which are somewhat smaller than normal, have not as yet been tested for germination. Later developing clusters also contained pistillate flowers in the same position as those in the first cluster.

Investigations thus far made lead to the conclusion that the removal of the terminal bud causes the change. In the attempt to disprove native claims that the removal of the terminal bud in the new of the moon would usually cause this transformation, the author finds that although the moon's phase does not appear to have any control, those trees treated at a fairly definite recurring period are the ones that show change. It is suggested that the plant has definite short cyclic periods of growth, and that it may be necessary to remove the tip at some definite phase of this cycle in order to produce the development of fertile flowers. Further data are being collected in connection with this subject.

The cacao fermentation and the preparation of cacao from harvest to shipping, together with studies on the fermentation of coffee and tobacco, A. Schulte (*Die Kakao-Fermentation und die Verarbeitung des Kakaos von der Ernte bis zum Versand sowie Kaffee- und Tabak-Fermentations-Studien. Berlin, 1908, pp. 35*).—A summarized account is given of cacao fermentation studies started by the author in Kamerun in 1899 and later continued in Germany, together with the application of the results on a cacao plantation on St. Thomas in 1903. Directions are given for harvesting, fermenting, drying, and shipping cacao, and suggestions relative to the practical application, without important changes, of the processes used by the author in his experiments. Brief studies relative to the fermentation of coffee and tobacco are also reported.

As a result of his investigations, the author divides cacao fermentation into 2 stages, (1) the alcohol and acetic acid fermentation, and (2) oxidation. He bases the production of good cacao upon a correct execution of both stages. During the alcohol and acetic acid fermentation, the seeds are freed from the pulp and the shells softened, thus favoring oxidation. The oxidation of the astringent substances is the important feature of cacao fermentation. An oxidation temperature of from 40 to 45° appears to be most favorable for the quality of the product, and a moisture content of 15 per cent was found to be most favorable to oxidation and at the same time unfavorable to butyric acid fermentation and the formation of mold. When the oxidation process is conducted satisfactorily a delicate white efflorescence forms on the beans, which may be taken as an indication that the cacao has been oxidized. Oxidation should be continued only until the majority of the beans have taken on a brown color, as if the oxidation is continued until all the beans are brown, the flavor and aroma are weakened. The proper length of time for oxidation can only be determined by experience and may vary in different cacao districts and with different kinds of cacao as well as with different harvesting methods.

As a result of his brief studies on the fermentation of coffee and tobacco, the author concludes that oxidation is as important with them as in the fermentation of indigo, tea, and cacao.

The unheated greenhouse, K. L. Davidson (*London, 1907, pp. VIII+248, pls. 46*).—In this popular work the author makes a plea for a more frequent use of the unheated types of greenhouses by amateur gardeners and gives considerable information, based on many years of practical experience, relative to the management of these houses and to suitable plants and their cultural treatment.

The introductory discussion deals with the advantages of typical forms of unheated greenhouses, hints on construction, regulation of temperature, and plants suitable and unsuitable. The suitable plants discussed include alpine plants, foliage plants for grouping, hardy and half-hardy species of bulbs and tubers, lillies, flowering shrubs, hard-wooded plants, roses, hardy perennials for spring, autumn perennials, annuals and biennials, hardy orchids, and succulent plants.

An extensive appendix is made up of lists of these various forms of plants, containing data relative to their height and color, habitat and season under glass, soil requirements, and general remarks.

FORESTRY.

North American trees, N. L. Britton and J. A. Shafer (*New York, 1908, pp. X+894, figs. 781*).—This work is one of an extensive series known as the American Nature Series, which is to be produced under the guaranty of American experts and from the American point of view. The present work contains systematic descriptions and illustrations of all species of trees known to be indigenous in North America north of Mexico and the West Indies, including all species which are known to become trees, even though they are almost always shrubs. The relationships of the native and naturalized trees of North America to those of other parts of the world are discussed, and the products of trees useful in the arts, sciences, and industries are mentioned or described. The illustrations show the character of the foliage, flowers, and fruit, and a number of photographs illustrate the general aspect of certain species. A glossary of special terms employed is appended.

Wayside and woodland trees, E. Step (*London, 1907, pp. 182, pls. 127, figs. 58*).—A popular pocket guide to the British sylva, designed for the rural rambler and nature lover. Part 1 includes species generally considered indigenous to the British Islands, with brief notes on closely related introduced species. Part 2 is devoted to species of foreign origin. In addition to the common and botanical name, the distinguishing characters of each species are pointed out, together with notes on distribution, habitat, economic uses, etc. The photographs are an important feature of the work. The deciduous trees are shown in both their summer and winter aspects, and illustrations are also given of floral organs and in many cases of the bole.

The conifers and other gymnosperms, F. W. Neger (*Die Nadelhölzer (Koniferen) und übrigen Gymnospermen. Leipsic, 1907, pp. 185, figs. 85; maps 4*).—This work contains systematic descriptions of the various genera and species of gymnosperms, together with brief notes on their anatomy, morphology, characteristics, distribution, and economic value. In an appendix the various trees are grouped together according to the nature of their wood, seeds, and seedlings, and maps are also given showing the geographic distribution of the more important species.

Observations on the species grown by the Section of Streams and Forests, F. Albert (*Algunas Observaciones sobre las Especies Cultivadas en la Seccion de Aguas i Bosques. Santiago de Chile: Sec. Aguas i Bosques, Min. Indus., 1908, pp. 68, figs. 19; An. Agron. [Santiago de Chile], 2 (1907), No. 4, pp. 585–650, figs. 19*).—Notes are given on a large number of trees being tested by the Section of Streams and Forests in Chile, including their origin, general characteristics, and adaptability for different purposes.

The manna gum (Eucalyptus viminalis), F. Albert (*An. Agron. [Santiago de Chile], 2 (1907), No. 3, pp. 318–349, figs. 14*).—A monograph on this species of eucalyptus, including a botanical description with common names and

synonyms, range and distribution, soil and climatic adaptability, seed collection, methods of propagation, planting, and subsequent care with special reference to its culture in Chile, and notes on the timber and its uses.

The red gum (Eucalyptus resinifera). F. ALBERT (*An. Agron. [Santiago de Chile], 2 (1907), No. 1–2, pp. 100–131, figs. 11*).—A monograph on this species of eucalyptus similar to that noted above for *E. viminalis*.

The Australian blackwood (Acacia melanoxylon). F. ALBERT (*El Aromo de Australia o Acacia melanoxylon. Santiago de Chile: Soc. Aguas i Bosques, Min. Indus., 1908, pp. 41, figs. 18; An. Agron. [Santiago de Chile], 2 (1907), No. 4, pp. 651–689, figs. 18*).—A monograph on this species treated in similar manner to those above noted.

Shelter planting, with special reference to the Acacia and Eucalyptus families and their raising. J. E. BARRETT (*New Zeal. Dept. Agr., Dir. Live Stock and Agr. Bul. 1, pp. 10, dgms. 2*).—Popular directions are given for the cultivation of acacia and eucalyptus trees for use as shelter belts. The trees specially recommended for this purpose, owing to the value of the timber and other products in addition to their usefulness as shelter, are the black wattle (*Acacia decurrens*), blackwood (*A. melanoxylon*), *Eucalyptus amygdalina*, and *E. rostrata*.

Type and variability in the annual wood increment of Acer rubrum. A. DACHNOWSKI (*Ohio Nat., 8 (1908), No. 7, pp. 343–349, fig. 1*).—To obtain direct evidence relative to the influence of habitat on the annual accretion of wood, measurements were taken of the width of the annual rings of several red maple trees recently felled, both in a bog and on the shores near by. These data are presented in tabular form, and the author briefly discusses the value of a biometric study in differentiating habitats. The conclusion is reached that a biometric record of secondary growth in trees furnishes a very valuable criterion for the comparison of the conditions of different plant habitats. The text is accompanied with a brief bibliography of works in which biometric methods are discussed.

A preliminary note on the development of the sal in volume and in money value. A. M. F. CACCIA (*Indian Forest Rec., 1 (1908), No. 2, pp. 238, pl. 1, dgms. 4, map 1*).—The author has aimed to bring together the statistical data at present available regarding the development of sal trees and sal woods in volume and in money value.

In part 1 the sal-bearing regions of India are briefly outlined and a table is given showing the distribution of the government sal forest reserves within those regions. Part 2 deals with the development of the stem of single sal trees, including height, girth, and volume increment, stem shape and stem form factors, volume tables, and volume increment percentage. An extensive list is given of all existing sample plats of sal maintained by the forest department in the Bengal Presidency for the purpose of determining the rate of girth increment, the results of measurements thus far recorded being given. Succeeding parts of the work deal with the development of the different parts of a sal tree, the stem development of whole stands, and the development of the money value of single trees and whole stands. In Appendix A the more important sylvicultural problems relating to the sal are outlined, and a further appendix contains data on the growth of some of the companion trees of the sal. A list is given of the literature consulted, together with a map showing the distribution of sal reserved forests in 1907 in the Bengal Presidency.

Native and planted timber of Iowa. H. P. BAKER (*U. S. Dept. Agr., Forest Serv. Circ. 154, pp. 5–24, fig. 1*).—Investigations were made during 1905 by the Forest Service to determine the extent, character, and value of the native farm wood lots and planted groves in Iowa, with a view of aiding in the movement

toward practical forestry in that State. Results of the investigations are embodied in this circular. The adaptability of the State to tree growth is discussed relative to its topography, soil, climate, and drainage, and an account is given of the native timber relative to its distribution, natural extension, condition, utilization, management, fire, insects, and fungi. The planted timber is also discussed with regard to the species, purpose of planting, and probable causes of success or failure, and suggestions are given for the planting and care of wind-breaks, and planting for commercial purposes. A table based upon typical groves in different parts of the State shows the returns which have been obtained from various species under ordinary conditions of treatment.

Cooperative forestry work, W. J. GREEN and E. SECREST (*Ohio Sta. Circ. 82, pp. 9, figs. 4*).—A popular circular discussing several phases of wood-lot management as well as artificial plantings for special purposes, such as wind-breaks, the utilization of waste lands, and for the prevention of erosion. A brief account is also given of the cooperative plan of the forestry work of the station. The text is accompanied with a county map of the State showing the number of cooperators and number of trees planted in each county.

During the past 4 years the station has undertaken cooperative forestry work with 544 landowners in 86 counties of the State. In all 645,274 trees were distributed for demonstration and experimental purposes.

National forests with related projects and data (*U. S. Dept. Agr., Forest Service, map, pts. 4, July 1, 1908*).—This is a base map of the United States, including Alaska, Porto Rico, and the Philippine Islands, compiled by the Drafting Division of the General Land Office, Department of the Interior, and reissued to show the National forests and related projects and data, by the Office of Geography in the Forest Service. The information was furnished by the U. S. Reclamation Service, the Weather Bureau of this Department, and the Inland Waterways Commission. In addition to the National forests the proposed Appalachian and White Mountain National Forests, the Reclamation Service irrigation projects, private irrigated areas, canals and proposed waterways, overflowed lands of lower Mississippi River, principal watersheds, and lines of equal precipitation are indicated.

Report of the departmental committee on Irish forestry, T. P. GILL ET AL. (*Dept. Agr. and Tech. Instr. Ireland, Rpt. Dept. Com. Irish Forestry, 1908, pp. V+60*).—An investigation was made under the direction of the Department of Agriculture and Technical Instruction for Ireland relative to the present provision for State aid to forestry in Ireland, the means whereby, in connection with the operation of the land-purchase acts, existing woods may be preserved and land suitable for forestry acquired for public purposes, and the financial and other provisions necessary for a comprehensive scheme of afforestation in Ireland. The present report embraces the results of this investigation.

Departmental committee on Irish forestry (*Dept. Agr. and Tech. Instr. Ireland, [Rpt.] Dept. Com. Irish Forestry, Minutes of Evidence, etc., 1908, pp. VII+484, maps 4*).—This volume contains the minutes of evidence secured by the departmental committee in the investigation above noted, together with a large number of appendixes consisting of minor reports and data collected in connection with the investigation.

Progress report of forest administration in Baluchistan for 1906–7, S. SINGH ET AL. (*Rpt. Forest Admin. Baluchistan, 1906–7, pp. 41*).—A statement of forest operations for the year relative to alterations in forest areas, forest settlements, surveys, protection, sylvicultural operations, exploitation, financial results, and administration. The important features of the work are presented in tabular form.

Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1906–7 (*Admin. Rpt. Forest Circles Bombay, 1906–7, pp. 197*).—Data similar to the above are presented relative to the administration of the State forests in the Northern, Central, and Southern circles of the Bombay Presidency and Sind.

Reports of the forest administration in Burma for the year 1906–7 (*Rpts. Forest Admin. Burma, 1906–7, pp. 177*).—Data similar to the above are presented relative to forest operations in the Pegu, Tenasserim, Northern, and Southern forest circles.

The preservative treatment of loblolly pine cross-arms, W. F. Sherfesee (*U. S. Dept. Agr., Forest Serv. Circ. 151, pp. 5–29, figs. 9*).—A detailed account is given of experiments conducted by the Forest Service in cooperation with the American Telephone and Telegraph Company and the Norfolk Creosoting Company to demonstrate the inequality of the treatment received by different classes of loblolly pine cross-arms and to furnish a basis for the development of more uniform and economical treatments.

The results of the entire study are summarized in substance as follows. Cross-arms should be graded during manufacture into 3 classes: Class A consisting of arms containing 75 per cent or more of heartwood, class B 75 per cent or more of sapwood, and class C less than 75 per cent of either heartwood or sapwood. The arms should be piled in the seasoning yard until they have approached an air-dry condition, when they should be shipped direct to the treating plant and unloaded on the cylinder buggies. Each class of arms should be treated separately, the usual preliminary bath of live steam being omitted and a vacuum applied only sufficient to draw the oil from the storage tanks into the treating cylinder. If necessary, additional pressure should be applied to force the oil into the heartwood portions of the arms. The exact amount of oil absorbed should be noted, and surplus oil blown back into the storage tanks and a vacuum drawn and continued in the treating cylinder until only the desired amount of oil is left in the timber. Heartwood arms should finally contain about 6 lbs. of oil per cubic foot, sapwood arms about 10 lbs., and intermediate arms about 8 lbs.

The total duration of the average treatment is estimated as considerably under 2 hours.

Exports and imports of forest products: 1907, A. H. Pierson (*U. S. Dept. Agr., Forest Serv. Circ. 153, pp. 3–26*).—Statistical summaries and detailed data are given relative to the exports and imports of forest products including both raw and manufactured material of various kinds for 1907. The data are taken chiefly from the report of the Bureau of Statistics of the Department of Commerce and Labor upon The Foreign Commerce and Navigation of the United States for the year ending June 30, 1907. The summaries of the exports and imports of forest products from and to the United States for the years 1903 to 1907 inclusive show an increase in value of 48.6 per cent for the exports and 69.8 per cent for the imports. In some cases the increase is due to higher prices and in others to larger quantities.

Turpentine and rosin (*Bur. of the Census [U. S.], Manfrs., 1905, pt. 3, pp. 647–657*).—A statistical discussion of the manufacturing of turpentine and rosin as reported at the census of 1905, including comparisons with previous censusses, and a discussion relative to the immediate future of the industry.

Investigation of Manihot rubber, W. Schellmann (*Pflanzer, 4 (1908), No. 3, pp. 39–45*).—Analyses were made of the rubber taken from 48 trees of *Manihot glaziovii*, varying in age from less than 1 year up to 11 years, with the view of determining whether increasing age has a deteriorating effect on the

rubber. The results are tabulated and discussed. Up to 11 years of age the composition of the rubber is not materially altered.

The author is of the opinion that in a climate generally suitable for the culture of Manihot, profitable quantities of rubber may be procured from trees growing either at high or low altitudes and either remote from or adjacent to the coast. To support this opinion, analyses are given of samples of rubber from 27 trees growing in various parts of German East Africa and in altitudes ranging from 50 to 1,350 meters above sea level. Allowing for difference in the age of trees, no great variation was noted in the amount of rubber produced from trees grown in the different sections.

DISEASES OF PLANTS.

Seed treatment for the smuts of winter barley, F. D. Heald (*Nebraska Sta. Rpt. 1907, pp. 45–53, figs. 4*).—Winter barley has been grown at the experiment station for the past 3 years, and has been found to be badly infected with smut, the plat grown in 1905 showing 10 per cent of smut and that in 1906, 15 per cent. Since seed treatment for barley smuts has not been as satisfactory as with some other cereals, it was considered advisable to compare some of the different methods and to try a number of modifications. The barley was affected by 2 species of smuts, the covered smut (*Ustilago hordei*) and the naked smut (*U. nuda*).

The treatments consisted of seed treatment with formalin, hot water, corrosive sublimate, and copper sulphate. The formalin solutions were of strengths varying from 1 pt. to 10 gal. of water to 1 pt. to 25 gal. The hot-water treatment consisted of a preliminary soaking of the seed in cold water for 4 hours, after which it was set away in the wet sack for 4 hours more. It was then warmed by submerging in water at 110 to 120° F. for a few minutes, after which it was immersed in hot water, 126 to 130°, for 5 minutes, and then spread to dry. The corrosive sublimate treatment consisted of solutions of 3 parts corrosive sublimate in 1,000 parts of water, and half strength of the above. With the copper sulphate treatment, one lot was immersed in copper solution (1 lb. to 24 gal. of water) for 12 hours, then in lime water for 5 minutes, after which it was spread to dry. With the other lot, the treatment consisted of soaking the seed in water for 6 hours, then in copper solution (1 lb. to 18 gal. of water) for 6 hours, followed by a lime water treatment and drying as usual.

The results of the different treatments are shown, from which it appears that barley smuts can be very greatly lessened by the use of any of the treatments employed. The more effective treatments and those recommended are formalin solution, using 1 pt. to 20 to 25 gal. of water, the hot-water treatment, and the copper sulphate treatment.

Cotton wilt, W. A. Orton (*U. S. Dept. Agr., Farmers' Bul. 333, pp. 5–24, figs. 11*).—A popular account is given of the disease of cotton variously known as wilt, blackheart, frenching, etc., due to *Neocosmospora vasinfecta*. The field characters of the disease are described, and the various factors which influence its development are discussed. An account is given of experiments in breeding resistant plants, and some varieties of upland cotton that have proved nearly resistant to this disease are described.

The potato rot, G. Gándara (*Estac. Agr. Cent. [Mexico] Bol. 2, pp. 20, figs. 19*).—A description is given of the potato rot due to *Phytophthora infestans*, with suggestions for its control by the use of fungicides.

Spongospora solani, or corky scab, T. Johnson (*Econ. Proc. Roy. Dublin Soc., 1 (1908), No. 12, XX, pp. 453–464, pl. 1*).—While investigating the yellow

blight of potatoes in the west of Ireland, the author was struck with the common occurrence of scabbiness in the potato tubers, and upon examination he found that the trouble was due to the fungus *S. solani*, which had been hitherto considered as rare and apparently of only biological interest. In investigating this trouble, the author found nearly every plat of potatoes in the district visited affected by the scab, the tubers being greatly reduced in market value, as well as being made almost worthless for seed purposes.

This disease may be recognized with the aid of a low-power lens, showing on the damaged skin of the tubers yellowish-brown particles resembling grains of sand. These are spore-balls of the fungus, and in the first stage of the disease the tuber skin is raised above the general surface, the patches being ⅛ to ¼ in. in diameter. Later the surface of the skin becomes ruptured and the spore-balls liberated. The elevations then become depressions, and gradually the depressions become deeper and wider, the parasite literally gnawing away the substance of the tuber. In some cases, however, the tuber successfully resists the fungus by the formation of protective cork layers.

A description is given of the fungus and its action in various media, after which the author suggests means for its control. He regards the fungus as a dangerous parasite, allied to the slime fungi Ceratiomyxa and Plasmodiophora. The potato crop becomes scabby, either through the planting of healthy tubers in scabby soil or by planting scabby tubers. Want of drainage and aeration of the soil tend to increase the virulence of attack. Crop rotation, the treating of seed tubers with Bordeaux mixture or a 2 per cent solution of copper sulphate before planting, the planting of uncut tubers, soil treatment with sulphur, and thorough cultivation are recommended as remedial measures.

A disease of sea-kale, E. S. Salmon (*Gard. Chron., 3. ser., 44 (1908), No. 1123, pp. 1–3, figs. 3*).—During the autumn of 1906 sea-kale was observed to be badly damaged by the fungus *Rhizoctonia violacea*. This fungus attacked the roots, reducing the crop to a considerable extent. So serious were the effects of the disease that in 1907 experiments were carried on to determine the possibility of preventing it by treatment of the seed beds.

Just before planting in March, 1907, beds were prepared and treated with solutions of copper sulphate, iron sulphate, corrosive sublimate, carbolic acid, formalin, and petroleum, and dusted with sulphur and quicklime, which were worked into the soil. The effect of the different treatments is shown. Copper sulphate and corrosive sublimate reduced the disease to some extent, while the plat receiving the carbolic acid at the rate of 1 oz. to 1 gal. of water was practically free from the disease. The other treatments were without definite effect.

Some tomato fruit rots during 1907, Venus W. Pool (*Nebraska Sta. Rpt. 1907, pp. 1–33, figs. 33*).—Studies are reported on various diseases of the tomato, among them the black rot due to *Alternaria fasciculata*, a Rhizoctonia disease, the anthracnose caused by *Colletotrichum lycopersici*, a Fusarium disease due to an undetermined species, and a disease due to *Fusarium solani*.

The anthracnose was found on nearly all the late tomatoes, while the peculiar blackened condition produced by *Fusarium* sp. occurred on at least half of the earlier fruits. The other rots occurred in greater or less abundance during the main part of the season. Plants which have an upright position of growth with smooth, thick-skinned fruits, such as the Dwarf Champion, were found freer from disease than the trailing thin-skinned varieties, as the Stone.

The employment of proper sanitary measures and spraying with Bordeaux mixtures are recommended for the control of these diseases.

A bibliography is appended.

A root rot of grapes due to Pestalozzia uvicola, F. A. Wolf (*Nebraska Sta. Rpt. 1907, pp. 69–72, fig. 1*).—A report is given on studies made of ripe grapes

brought to the laboratory in 1907 that were covered with numerous black pustules. A microscopical examination of the material showed that the spores were those which characterize the genus Pestalozzia, and further studies indicated that the species was *P. uricola*, of which no record of occurrence in America had been previously reported.

Arsenical poisoning of fruit trees, W. P. HEADDEN (*Colorado Sta. Bul. 131, pp. 3–27, pls. 7*).—The author was called upon to investigate some shade and ornamental trees, the bad condition of which was claimed to be due to arsenic and lead. Subsequently other investigations were carried on to determine whether the arsenic used so extensively as calcic arsenite and lead arsenate for the control of insect pests is responsible for the rapid destruction of trees in a number of the principal fruit districts of the State.

The author made analyses of soils, different parts of trees, etc., and in samples of trees he found present from 1.25 to 12.77 parts of arsenic per million of woody tissue. While the arsenic is generally in an insoluble form, soluble arsenic was found present in the soil in amounts that are believed dangerous to the life of the tree.

In addition to arsenical poisoning, the author discusses briefly lead poisoning and the effect of lime, which in some regions seems to have an unquestionably injurious influence on the trees. In one instance, where the sap had exuded from the tree and dried, he found that the air-dry material contained 24.93 per cent of lime.

In conclusion, the author states that there are a large number of fruit trees in the State suffering from an affection of the trunk and root, the trouble beginning in the greater number of cases at the crown of the tree and subsequently involving both trunk and roots. The first marked symptom is an early ripening of the foliage, usually followed by the death of the tree about midsummer of the ensuing year. The crown of the tree is found to be girdled, the bark on portions of the trunk dead and sunken, and most of the roots dead, the bark destroyed, and the woody tissue discolored. Experiments showed that soluble arsenical compounds will effect the destruction of the bark, the staining of the wood, the production of the so-called blackheart, and the speedy death of the tree.

Arsenical poisons have been extensively used in the orchards under investigation and these compounds have accumulated in the soil. While the accumulation of arsenic in the soil is usually in an insoluble form, it has probably passed beyond the limit of danger in a soluble form, the alkalis, such as sodium carbonate, sodium sulphate, and sodium chlorid rendering the arsenic soluble. The lime salts do not appear to protect effectively the arsenical compounds from the solvent action of the alkalis. It is thought that systematic poisoning may take place, and probably does, by the absorption of the arsenic with the nutritive solutions taken up by the feeding roots, but the greater portion of the trouble appears to be due to local irritant poisoning.

The arsenic in the arsenate of lime is more readily brought into solution than that of the lead arsenate. Arsenical poisoning it is believed is in many cases complicated by lime poisoning, the lime or marl in the soil and subsoil acting conjointly with the arsenic in producing some of the injury.

The Fusicladium disease of the pear and apple, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 33 (1908), No. 1, pp. 16–32, figs. 10*).—An account is given of the disease of apples and pears known in this country as apple and pear scab, due to *Fusicladium dendriticum* and *F. pyrinum*. Both these diseases have made their appearance in South Africa and are causing considerable injury. The effect of the fungus on the host plants and the conditions which favor the spread of the disease are described, and suggestions given for preventing the

attacks of the fungi by the use of Bordeaux mixture or other fungicides. The author calls attention to the copper soda spray as a substitute for Bordeaux mixture, but where fresh lime is available, he thinks that the Bordeaux mixture as commonly made with lime is to be preferred.

Notes are also given on bitter pit disease of apples, which seems to be due to physical conditions in the environment of the tree which are unfavorable to a perfect development of the fruit, and on Entomosporium spot disease.

Notes on some diseases of apple trees, E. Prillieux (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 5, pp. 286–291*).—An examination was made of twigs from apple trees which were submitted to the station of plant pathology, from which it was found that they were in most cases attacked by *Nectria ditissima*, causing cankers.

The effect of the fungus on the twigs is described, and the author states that the disease is not a new one, as was feared by the owners of the orchard, but was mostly caused by the presence of the Nectria mentioned above. In addition he found some other fungi present, particularly Monilia.

For preventing the injury, the author recommends the use of resistant varieties, better drainage of the soil, the burning of diseased twigs, and winter treatment with fungicides.

A new form of Sphæropsis on apples, Leva B. Walker (*Nebraska Sta. Rpt. 1907, pp. 34–44, figs. 10*).—Two forms of Sphæropsis have been observed which are capable of producing a severe black rot of the apple. In macroscopic appearance the rots are very much alike, the principal differences in the 2 forms being the size of the spore, the size and thickness of the pycnidium, and the absence of the ostiole in the new form. The new form has decidedly longer spores than is commonly described for *S. malorum*, and it seems to be a much more vigorous grower and to do more damage than the common form. Whether the long-spored form should be considered a new species or a form of *S. malorum*, is not determined. A bibliography is given.

Studies on the genus Gymnosporangium, F. D. Kern (*Bul. Torrey Bot. Club, 35 (1908), No. 10, pp. 499–511*).—A study has been made of the so-called cedar apples and rusts associated with them for the purpose of bringing together data in such a manner as to be of material assistance in the determination of the North American species. A key is presented involving the more evident diagnostic characters and indicating the host plants for each. Preceding the key, notes are given on some of the species, explanatory of their nomenclature, extension in range, and other interesting features which have been revealed in the investigations.

A disease of cloves, H. N. Ridley (*Agr. Bul. Straits and Fed. Malay States, 7 (1908), No. 7, pp. 263, 264*).—The cultivation of clove trees is said to have been an extensive industry at one time in Singapore, but it has almost ceased to be of importance owing to disease. An old tree in the Singapore Botanic Gardens gave the author an opportunity for studying the cause of the trouble, and he found the tree affected by a red-spot fungus.

The fungus forms dark red spots on both surfaces of the leaves, the spots increasing in size until they attain a diameter of 0.2 in. or more. The leaf is often attacked when just opened, before it has attained its full green coloring, and the author is inclined to think that the attack most commonly begins in the bud. The fungus has not been definitely determined, but it appears to belong to the Peronosporaceæ.

The author believes that the fungus destroys many seedlings through attacking the buds, and that spraying with a weak solution of Bordeaux mixture would protect them from attack.

Report on cocoanut palm disease in Travancore, E. J. Butler (*Agr. Research Inst. Pusa [India] Bul. 9, 1908, p. 23; noted in Agr. Jour. India, 3 (1908), No. 2, pp. 177–179*).—A serious disease of cocoanut trees has been spreading in Travancore and materially reducing the yield of nuts. The first indication of the disease is the yellowing of the leaves, as though the trees did not get sufficient water. A year or two after the first appearance of the disease, all the leaves turn yellow and dry up at the tips. When this happens the bunches of nuts become affected. Some do not ripen properly, but fall to the ground in an immature condition, and after a few years none at all are borne. After from 5 to 10 years the diseased palm dries up altogether.

The cause of the disease appears to be a minute fungus, which attacks the roots in the soil, causing them to rot. In addition to cocoanut palms a number of other species of palm are subject to attack. As the parasite which is the probable cause of this disease enters the roots, it is out of reach of direct treatment, but in order to eradicate the disease the author recommends the destruction of all diseased material, cultivating land where diseased cocoanuts have been grown, the application of manure, generally stimulating the health of trees, and the use of disease-resistant varieties.

In conclusion the author briefly describes the leaf disease of cocoanut palms due to *Pestalozzia palmarum* and the bud rot caused by *Pythium palmivorum*.

A disease of rubber trees in Puak, E. Smith (*Agr. Bul. Straits and Fed. Malay States, 7 (1908), No. 3, pp. 90–92, fig. 1*).—The author describes a disease of rubber trees that is apparently of fungus origin. Thus far he has been unable to complete the identification of the fungus, which seems to cause a disintegration of the cells of the bark and in some cases the cambium layer of the trees. In addition to the fungus a spore-bearing bacillus was present. The fungus bears a strong resemblance to Helicobasidium, and the disease is to be given further study.

The effects of Oïdium quercinum on different species of oak, E. Bureau (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 13, pp. 571–574*).—In the summer of 1907 oak trees in parts of France were badly attacked by *O. quercinum*, in some cases the old forests taking on an unusual gray color.

A study was made of the fungus causing the trouble, from which it was determined to be the species mentioned above. It was further found that some species of oak were less subject to attack than others, and in addition that the beech was liable to be attacked by the fungus when grown in coppice. The chestnut, which botanically is much more nearly related to the oak than the beech, seems to be absolutely resistant to attacks of the parasite.

The timber rot fungus (Merulius lachrymans), C. Mez (*Der Hausschwamm und die übrigen holzzerstörenden Pilze der menschlichen Wohnungen. Dresden, 1908, pp. VII+260, pl. 1, figs. 90*).—A study is given of the timber dry-rot fungus and a number of related species that attack construction timber in dwellings, etc. The relation of these fungi to health is discussed, and suggestions are given for preventing their occurrence. About 40 species belonging to the genera Merulius, Polyporus, Lenzites, Dædalea, Hypholoma, Armillaria, Hydnum, and Corticium are described, all of which are not equally destructive.

For the prevention of dry-rot injury, it is recommended that special attention be paid to the general conditions about buildings in relation to moisture, choice of construction materials, use of preservative agents, etc.

The mold of maple sirup, F. D. Heald and Venus W. Pool (*Nebraska Sta. Rpt. 1907, pp. 54–68, figs. 7*).—During the past few years a mold has been frequently observed growing on maple sirup exposed in various containers to the air of the household, and even in the original container if a small amount

of the sirup had been removed. Studies were made of this mold, and it was found to be a species of Torula closely related to *T. saccchari-lactis*, from which it differs in the average size and color of the spores and the ultimate branchlets and in the absence of the delicate prickles. The fungus is supposed to be an undescribed species and is named *T. saccharina*. The characters of the fungus grown in various cultures are described at length.

Analyses were made of various sirups to determine whether the molding of the different kinds of sirup was due to the low sugar content. It was found that by increasing the total sugar content the growth of the Torula was nearly inhibited, and it is evident that market products should be made more concentrated than is the common practice.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The Alaska game law and regulations of the Department of Agriculture, 1908 (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 66, pp. 8*).—"Under the new law, approved May 11, 1908, Alaska is divided at latitude 62° into two game districts, with special seasons for each district. Caribou on the Kenai peninsula are protected until 1912. Nonresidents hunting big game other than deer or goats and residents desiring to export heads or hides of big game from Alaska are required to obtain licenses. Authorization is also given for the employment of wardens and registration of guides. All matters relating to the issue of licenses, employment of wardens, and the registration of guides are placed in charge of the governor of Alaska. . . . The Department of Agriculture will continue as heretofore to issue permits for the collection and shipment of specimens for scientific purposes and for live animals and birds for exhibition or propagation."

The text of the new law and the regulations prescribed by this Department to take effect October 1, 1908, are given.

Directory of officials and organizations concerned with the protection of birds and game, 1908, T. S. Palmer (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 65, pp. 16*).—This circular presents in convenient form the names of persons to whom application may be made for information respecting game laws. It also shows the date of establishment of each State commission or wardenship, the changes which occur in such offices, and the publications issued by game officials. The addresses are grouped under the headings State officials, National organizations, State organizations, and Audubon societies.

The use of bacteria in destroying rats, Xylander (*Ztschr. Fleisch u. Milchhyg., 18 (1908), No. 8, pp. 241–245*).—The literature relating to the various bacterial cultures which have been used in destroying rats is critically reviewed. The author considers that at the present time it has not been demonstrated that any of these cultures are invariably harmless for animals other than rats.

Exterminating field mice with barium carbonate, L. Hiltner and G. Korff (*Prakt. Bl. Pflanzenbau u. Schutz., n. ser., 6 (1908), No. 4, pp. 37–40*).—A number of experiments were made with two kinds of virus designed for the destruction of mice. The results were fairly satisfactory. Samples of virus were distributed to various individuals but only two reports were received both of which were favorable. On the whole, however, the method of using poisoned baits is more efficient. The best results were obtained from the use of barium carbonate in an attractive bait. This remedy was tried in various localities with good success.

The dissociation of specific characters in hybrids between certain birds, A. Ghigi (*Atti R. Accad. Lincei Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908)*.

I, No. 7, pp. 453–451).—Details are presented regarding the characters observed in hybrids between distinct species of Gennæus, Phasianus, and Numida. In all of these hybrids the characters in the first generation were not those of either parent but were intermediate between those of the parent forms.

Wild birds, useful and injurious, C. F. Archibald (*Jour. Roy. Agr. Soc. England, 63 (1907), pp. 17–32, figs. 7*).—Attention is called to the lack of specific information among farmers regarding the economic status of various common species of birds. In order to assist in a better understanding of the relationship of birds notes are given on the feeding habits of the starling, rook, magpie, martin, cuckoo, ringdove, pheasants, sea gulls, etc.

Some common birds of Oregon, W. L. Finley (*Leaflets Listing and Describing Birds of Oregon, No. 2, pp. 16, figs. 10*).—A popular discussion was presented of the feeding habits and economic relations of a number of the common birds of Oregon, including the red-shafted woodpecker, western robin, western bluebird, California jay, crow, kingfisher, western meadow lark, etc.

The locust plague in Hortobágy in 1907, and birds, J. Schenk (*Aquila, 14 (1907), No. 1–4, pp. 223–275, pl. 1, figs. 4*).—A description was given of a serious outbreak of locusts which occurred in 1907. The species chiefly concerned was *Stauronotus maroccanus*. As the plague of locusts increased in extent and numbers various insect-eating birds were observed feeding upon the locusts. The habits of a number of species of birds on this occasion are described by the author. The starling and stork proved to be particularly instrumental in destroying the locusts.

A report on Trox suberosus, L. Ichies (*Bol. Min. Agr. [Buenos Ayres], 9 (1908), No. 1–2, pp. 36–44*).—Reports have been repeatedly received that *T. suberosus* feeds upon the eggs of locusts and should, therefore, be considered as an important help in the control of locusts. Careful observation of the beetle in cages specially prepared for this purpose failed to produce any evidence that the beetle feeds upon the eggs of the locust.

The destruction of Melolontha vulgaris, A. Vivien (*Atti 6. Cong. Internaz. Chim. Appl., 4 (1906), pp. 342–347*).—Statistical data are given showing the number of cockchafers which have been collected by school children and others. Encouraging results have been obtained in the dissemination of fungus disease among the cockchafers. It is not certain whether the fungus concerned is *Botrytis bassiana* or *Isaria densa*.

Miscellaneous papers. A record of results from rearings and dissections of Tachinidæ, C. H. T. Townsend (*U. S. Dept. Agr., Bur. Ent. Bul. 12, tech. ser., pt. 6, pp. 95–118, figs. 6*).—The author here reports the results of bionomic studies of tachinids made in connection with investigations by the Bureau of Entomology of this Department of the parasites of the gipsy and brown-tail moths. It is predicted that *Blepharipa scutellata*, *Palcs parida*, *Zenillia libatrix*, and an undetermined species of Crossocosmia will be found to deposit their eggs upon the leaves and be taken into the bodies of the caterpillars with the food. From dissections, 14 American and 5 European species have been determined to have the habit of depositing their eggs in this manner.

Eupelcteria magnicornis was found to larviposition on green shoots, leaf stems, leaf ribs, and occasionally on the surface of leaves near caterpillars to which the larvæ readily attach as the host passes. From dissections, 13 species have been determined to larviposit. *Dexodes nigripes* and *Compsilura concinnata* have the habit of depositing the living maggots inside the skin of caterpillars. *Parexorista cheloniæ*, *Parasetigena segregata*, *Tricholyga grandis*, *Tachina larvarum*, *T. utilis*, and *T. clisiocampæ* deposit eggs upon the caterpillars. It was found that in the leaf-oviposition species, the eggs and first

larval stage are much smaller than in the other tachinids and that as a result there is, in all probability, an additional maggot stage. While *T. elisiocampæ* oviposits very freely on large gipsy moth caterpillars, but few are parasitized, due to the inability of the young larvæ to penetrate the tough skin of the large *Porthetria dispar* caterpillars.

Parasetigena segregata is apparently a single-brooded species, *Palcs pavida*, *Zenillia libatrix*, and the species of Tachina are reported to be at least double-brooded, while *Compsilura concinnata*, *Dexodes nigripes*, and *Tricholyga grandis* appear to be at least three-brooded. It was found by dissecting the flies and examining the uterine eggs that the reproductive habit could be determined. This is also shown to be of taxonomic importance. Eggs from 70 species have thus been obtained and studied. Dissections show a variation in the reproductive capacity of the species of from 100 to 5,000 eggs. The late summer generations of several species were found to oviposit profusely on newly hatched fall webworms as an alternate host.

An account is given of the methods and apparatus used.

"The results of all this work on European, Japanese, and American tachinids point to the very great importance of *Blepharipa scutellata* and *Crossocosmia* sp. as parasites of *Porthetria dispar*. The great capacity for reproduction, possessed by these species, and the fact that all of their eggs must be eaten by the caterpillars wherever *P. dispar* is abundant, place them in the lead of parasites.

"No two species can be so relied upon as parasites of *Euproctis chrysorrhœa*, but the Japanese Tachinas, *Tricholyga grandis*, *Compsilura concinnata*, *Dexodes nigripes*, and *Parexorista cheloniæ* seem to be among the most important here.

"All of the other imported species mentioned will prove of much importance as aids in the control of one or both of these moths. The great majority of them are parasitic on both hosts."

The formation of the colonies of parasitic ants, H. Viehmeyer (*Biol. Centbl., 28 (1908), No. 1, pp. 18–32*).—In agreement with W. M. Wheeler (E. S. R., 20, p. 254), the position is taken on the basis of experimental work that in many species of ants, particularly *Formica truncicola*, *F. sanguinea*, and *Polyergus rufescens*, the so-called slave-making habit is more properly a form of parasitism.

Annual report for 1907 of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England, 68 (1907), pp. 229–241, figs. 4*).—During the year 1907, *Atomaria linearis* was particularly injurious to mangels. The beetle attacks the seed while it is germinating in the ground and later feeds upon the seed, leaves, roots, and other parts of the plant. It attacks both mangels and beets. Mention is also made of the injuries caused by various granary insects, cheese mite, Mediterranean flour moth, nematode worms, snails, slugs, *Tephritis onopordinis* on celery, and other insects.

Insects of the year 1907, R. S. Macdougall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 20 (1908), pp. 305–308*).—An emulsion soda wash has given good results in combating oyster-shell bark-louse. The formula used in the preparation of the wash called for ½ lb. sulphate of iron, ¾ lb. lime, 2 lbs. caustic soda, and 5 pts. of kerosene per 10 gal. of water. Economic and biological notes are also given on *Cryptococcus fagi*, woolly aphis, spruce gall aphis, ox warble flies, gooseberry sawfly, and *Abraxas grossulariata*.

[Notes on economic zoology], Rörig, Börner, and Moritz (*Mitt. K. Biol. Anst. Land u. Forstw., 3 (1908), No. 6, pp. 31–52, figs. 4*).—A study was made of the life history of phylloxera. The biology of this insect was found to be somewhat simpler than has usually been represented, the insect proving to be diecious with five types of generations.

A brief report is given on the results obtained from the use of various proprietary mixtures for preventing injuries to fruit trees by rodents. Brief accounts are also presented of the habits of *Arricola ratticeps* and on nematodes, woolly aphis, earwigs, and foul brood of bees.

Report of committee on entomology, H. A. Gossard (*Ohio Dept. Agr., Div. Hort. Bul. 1, pp. 53–67*).—Mention is made of spraying experiments carried on for the purpose of controlling the grape-berry moth. This moth caused the destruction of about 50 per cent of the grape crop in infested localities. The usual arsenicals were applied with good results. A brief account is also presented of spraying experiments for controlling codling moth and on the use of proprietary insecticides.

Some insect enemies of garden crops, R. I. Smith (*North Carolina Sta. Bul. 197, pp. 5–64, figs. 38*).—An account is given of the more common insect enemies of garden crops. Emphasis is placed upon the fact that even in the home garden success may depend upon the intelligent application of preventive and remedial measures. Under each insect considered a brief description is given of its life history and habits and of the particular remedial treatment necessary. Formulas and directions for preparing spray mixtures are appended.

The weeviling of maize in West Africa, R. Newstead (*Liverpool Univ., Inst. Com. Research Trop. Quart. Jour., 2 (1907), No. 4, pp. 27–31*).—The beetles chiefly concerned in the injuring of maize on the west coast of Africa are rice weevil, granary weevil, and an undescribed species of Bruchus. The biology and economic relations of rice weevil and granary weevil are described in some detail. For the control of these pests fumigation with hydrocyanic-acid gas or carbon bisulphid is recommended.

Sugar-cane borer, A. Ferreyros (*Bol. Min. Fomento [Peru], Dir. Fomento, 6 (1908), No. 1, pp. 57–68*).—The present status of the sugar-cane borer, particularly in Louisiana, is briefly outlined with notes on its habits and life history and the amount of damage caused by it. Natural enemies assist to a slight extent in controlling this pest. One of the most effective remedies is planting the cane so deeply as to prevent the emergence of borers.

The tobacco stem borer, H. M. Lefroy (*Agr. Jour. India, 3 (1908), No. 1, pp. 65–68, pl. 1*).—*Gnorimoschema heliopa*, so far as has yet been determined, feeds only upon cultivated and wild tobacco. The life history of the insect is described in detail. Its attacks are most serious upon the better varieties of cultivated tobacco. In controlling the pest it is recommended that wild tobacco in the vicinity of tobacco fields be destroyed and that the larvæ be cut out of the swellings in the stems in which they live.

The larvæ of the cabbage butterfly, G. Paoli (*Bul. R. Soc. Toscana Ort., 3. ser., 13 (1908), No. 4, pp. 100–103, figs. 3*).—The life history of *Pieris brassicæ* is briefly described with particular reference to the injuries caused by the larvæ of this species and the usual methods applied in controlling it.

Plutella cruciferarum, H. M. Quanjer (*Tijdschr. Plantenziekten, 12 (1906), No. 1–3, pp. 62–70, pls. 2, fig. 1*).—The habits and life history of the diamondback moth are described in some detail. In combating this pest satisfactory results have been obtained from brushing the caterpillars from cabbage leaves and immediately covering them in the soil with a shovel. The caterpillars may also be dislodged by a spray of water.

The blackberry leaf-miner, C. O. Houghton (*Ent. News, 19 (1908), No. 5, pp. 213–216*).—*Scolioneura capitalis* was observed injuring dewberries near Dover, Delaware, in 1905, and was found in considerable numbers during the following year. This species was first described in 1867. A technical description of the insect is given together with notes on its distribution. The insect is apparently parasitized by a species of Rhysipolis.

A new enemy of the strawberry in Germany, H. Morstatt (*Deut. Landw. Presse, 35 (1908), No. 35, p. 379, figs. 9*).—*Tarsonemus fragariæ* is reported as having caused great injury to strawberry plants by attacking the leaves. A brief account is given of the appearance and habits of this mite. Most of the insecticides which have been tested for controlling it have proved to be of little avail, and it has, therefore, been lately recommended that infested plants be removed early in the season and destroyed. It is believed, however, that frequent sprinkling of the plants with water alone or with a dilute solution of ammonia might be beneficial.

The use of arsenical compounds in the treatment of vineyards, H. Bertinsans and V. Ros (*Rev. Hyg. et Pol. Sanit., 30 (1908), No. 4, pp. 281–286*).—A lively controversy has recently developed especially in France regarding the possible dangers from the use of arsenicals in spraying vineyards. The fear has been entertained that such treatment might result in the passage of some of the arsenic into the wine. The experiments reported by the author indicate that the danger from the application of arsenicals in the early part of the season is practically none, but it is considered advisable to prohibit the use of arsenical insecticides after the grapes are in bloom.

Combating the olive fly, A. Berlese (*Bol. Quind. Soc. Agr. Ital., 13 (1908), No. 8, pp. 261–265*).—Brief mention is made of the damage done to olives by *Dacus oleæ*, together with a historical account of the development of the method of using a mixture of molasses, honey, and an arsenical in combating this pest. It has been found that if 2 per cent of arsenic be added to a mixture of equal parts of molasses and honey the mixture may then be diluted with water and sprayed on olive trees with good results.

The cocoanut beetle in Batticaloa, Ceylon, E. E. Green (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 3, pp. 105–109*).—The cocoanut beetle is extending its range rather rapidly as shown by the numbers captured by superintendents of cocoanut plantations and by the examination of cocoanut trees. Considerable work has been done in combating this pest by cutting out and burning the crowns and a few feet of the upper part of the stems of infested trees. The trunks of trees destroyed for any purpose may be used temporarily for fencing purposes, but as soon as they become decayed it should be understood that they furnish excellent breeding grounds for the cocoanut beetle.

The more important insects affecting Ohio shade trees, J. S. Houser (*Ohio Sta. Bul. 194, pp. 169–243, figs. 47*).—A general account of the insect enemies of shade trees of the State with directions for the preparation and application of insecticides. Accompanying the account are numerous illustrations of the insects considered, of the injury caused by them, and of spraying apparatus used in their control.

Forest injuries from insects, Hanff (*Jahrb. Schlesischen Forstver., 1907, pp. 39–52*).—The insect injuries which attracted most attention during the year were due to *Gastropacha pini*, *Nematus abietum*, cockchafers, *Pissodes piceæ*, gipsy moth, etc. The larvæ of *G. pini* infested trees in some cases to the extent of 3,000 or 4,000 per tree. In such cases the use of sticky bands was very advantageous.

Injury to Abies nobilis by Chermes piceæ bouvieri, E. Molz (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 2, pp. 151–154, figs. 4*).—*Chermes piceæ bouvieri* attacks the tips of growing shoots of *Abies nobilis* causing extensive malformations in the form of galls. The injury thus produced is quite serious, in some cases causing the death of the affected trees.

Some coleoptera affecting the honey locust, C. O. Houghton (*Canad. Ent., 40 (1908), No. 5, pp. 160–162*).—Large numbers of *Agrilus fallax* were observed feeding upon the leaves of the honey locust. Among the other coleop-

tera observed were *Xyleborus erythrocephalus*, *Xylonola punctipennis*, and *Macrobasis unicolor*.

A note on the lac insect, its life history, propagation, and collection, E. P. Stebbing (*Indian Forest Rec., 1 (1908), No. 1, pp. 84, pls. 2*).—The increased use of shellac in electrical work and in the manufacture of phonograph records has led to an increase in the price of the substance. Some attention has, therefore, been given to the method of collecting the crude material and to the artificial encouragement of the lac insect. Detailed notes are given on the growth of the industry from a historical standpoint, the life history of the lac insect, its food plants, enemies, and the injuries which it causes to forest trees. It is recommended that lac should be collected either before or after the swarming of the larvæ. A bibliography of the subject is appended to the article.

The life history of house flies, A. Griffith (*Pub. Health [London], 21 (1908), No. 3, pp. 122–127*).—The life history of house flies was followed through practically the whole cycle in order to determine more accurately those points which may be of value in formulating a campaign against these insects. It was shown by experiment that flies required water frequently. The egg hatches within about 24 hours after being laid and the larval stage lasts 4 days. On an average four layings of eggs are done by each female fly. In combating the house fly reliance must be placed chiefly on the frequent removal and destruction of manure and other rubbish in which flies may breed.

The bot fly (Gastrophilus equi), W. W. Froggatt (*Agr. Gaz. N. S. Wales, 19 (1908), No. 3, pp. 229–233, pl. 1*).—The life history of this insect is described by way of comparison with bot flies, which infest other animals and have different habits. Various chemical remedies have been suggested for destroying bots in the stomach of horses or for expelling bots. As a rule, the results obtained from this line of treatment are not promising. It is suggested that some benefit may be derived from careful grooming of the horses during a period when the eggs of the bot fly are deposited upon the hair.

The rôle of arthropods in the dissemination of diseases, B. Galli-Valerio (*Centbl. Bakt. [etc.], 1. Abt., Ref., 41 (1908), No. 11–13, pp. 353–360*).—A summarized statement is given regarding the agency of arthropods in disseminating various diseases. The arthropods which are concerned in carrying diseases may be classified into 3 groups—those which are simply carrying agents, those which produce direct inoculation, and those which serve as intermediate hosts of the pathogenic parasite.

Sericultural experiments, B. C. Basu Bahadur (*Ann. Rpt. Agr. Stas. East. Bengal and Assam, 1907, pp. 78–86*).—The experience of 4 years has shown that the winter climate of Shillong is cool enough for proper hibernation of eggs of European breeds of silkworms. It was found possible to secure a very even hatching of silkworm eggs by enclosing them in a cloth which was worn under the clothes of one of the workmen, the process of hatching by this method requiring 5 days. Two species of mulberries were tested (*Morus atropurpurea* and *M. indica*). The cocoons from silkworms raised on the latter species were heavier and contained more silk. Little or no trouble was experienced from pebrine or grasserie.

Silk culture and the silk industry in Turkey, N. N. Shavrov (*Shelkovodstvo i Shelkovaya Promuishlennost v Turtzii. Tiflis, 1907, pt. 1, pp. 302, pls. 11, figs. 45*).—An elaborate account is presented of the status of silkworm growing and silk manufacturing in various parts of Turkey and Syria. Attention is chiefly given to the statistics of production, the culture of mulberries, the breeds of silkworms used in various parts of Turkey, the management of silkworms, and the measures which have been taken for promoting this industry.

FOODS—HUMAN NUTRITION.

Food of man studies, L. H. MERRILL (*Maine Sta. Bul. 158, pp. 219–238*).—Analyses of tropical fruits and vegetables and miscellaneous food products are reported as well as studies of the effects of popping on the composition of corn and the digestibility of hulled corn and the results of an examination of graham flours with a view to determining whether the material submitted was true to name. Among the foods analyzed were yautia, air potato (*Dioscorea bulbifera*), avocado, papaya, tayote, sour sop, yams of different sorts, green pepper, egg fruit, sapodilla, yuquilla, and several kinds of candied, dried, and preserved nuts and fruits, and cereal breakfast foods.

The analyses of corn before and after popping showed that "the corn seems to suffer little chemical change beyond that resulting from a loss of water, the loss amounting to from one-half to two-thirds of the total water content. . . . A determination of the water soluble carbohydrates in the corn would probably have shown a gain in every case."

In eight of the digestion experiments with hulled corn this material and milk were the sole articles of diet. In eight additional experiments the hulled corn and milk were supplemented by bread, butter, milk, and candied peaches. The average results of these tests and the calculated digestibility of the hulled corn alone are shown in the table which follows:

Digestibility of hulled corn: Experiments with man.

Kind of food.	Protein.	Carbohydrates.	Heat of combustion.
	Per cent.	*Per cent.*	*Per cent.*
Hulled corn and milk	81.7	97.3	91.8
Hulled corn with mixed diet	90.9	97.0	95.5
Hulled corn alone	61.2	96.4	86.7

As the author points out, the digestibility of the protein and the availability of the energy of hulled corn are low in comparison with results which have been obtained with white bread. The simple mixed diet containing hulled corn was much more completely utilized than the diet of hulled corn and milk.

The comparative study of graham flour reported led the author to conclude that the suspicious sample was not true to name but a made-up product carrying a considerable proportion of low-grade flour.

Some unusual Japanese food products, O. LOEW (*Mitt. Deut. Gesell. Natur. u. Völkerk. Ostasiens, 11 (1906), No. 1, pp. 109–111*).—The use of young sprouts from a number of sorts of plants, of blossoms of several kinds, of fresh-water algæ, and of several insects as food in Japan is discussed. According to the author, a sort of chrysanthemum blossoms sold in the form of compressed tablets contain 3.8 per cent cane sugar and 20.6 per cent invert sugar, a portion of which is perhaps added during the process of manufacture. One of the fresh-water algæ, a species of *Nostoc phylloderma*, when thoroughly dried is said to contain 25 per cent protein.

The article also contains some general data regarding the use of soy-bean products and other Japanese food customs.

New Zealand boned beef, A. M. WRIGHT (*Chem. News, 97 (1908), No. 2514, p. 50*).—Analyses of canned boned veal and of beef from steers and cows are reported and discussed in connection with average figures. The cans from which the samples were taken had been in cold storage for 6 to 8 weeks and represent the average product as it reaches the market.

According to the author, with the exception of cow beef the composition was practically identical with that of the flesh of the average animal. Cow beef contained considerable more fat than the average, but he considers this a favorable characteristic.

Brown spots on beef, E. KLEIN (*Meat Trades' Jour., 26 (1907), Nos. 1002, p. 56; 1003, p. 62; 1004, p. 90; abs. in Vet. Rec., 20 (1907), No. 1000, pp. 168, 169; Hyg. Rundschau, 18 (1908), No. 7, pp. 414, 415*).—Brown spots on frozen meat were found to be induced by a variety of yeast. Experiments with animals showed that the yeast was not harmful. If meat is handled carefully and wrapped up in a cleanly way the author believes that such a discoloration will not occur.

The cuts of a hog carcass, W. DINSMORE (*Breeder's Gaz., 53 (1908), No. 9, pp. 474, 475, figs. 4*).—The division of the carcass in accordance with the trade requirements for standard mess pork is described.

Studies of the chemical composition of fish with reference to growth and environment, H. REUSS (*Ber. K. Bayer. Biol. Vers. Stat. München, vol. 1, pp. 185–220; abs. in Chem. Zentbl., 1908, I, No. 12, p. 1193*).—The analytical data include determinations of lecithin and calcium in addition to the usual proximate constituents. According to the author, the water in which fish are found has an effect upon their growth and nutrition.

Digestibility of milk products, R. BRUYNOGHE (*Rev. Gén. Lait, 6 (1907), Nos. 19, pp. 441–449; 20, pp. 464–472, figs. 2; 21, pp. 489–499, figs. 3; 22, pp. 512–522, figs. 3*).—A study of the digestibility of milk and milk products is reported in which the stomach contents were removed and examined at different intervals after the food was ingested. In general, the major portion of the milk had left the stomach in an hour to an hour and a half. Different phases of the question studied are discused in detail.

Lard, A. MCGILL (*Lab. Inland Rev. Dept. [Canada] Bul. 147, pp. 17*).—Of 140 samples of lard collected in the different Canadian inspection districts, 129 were genuine, 7 doubtful, 2 adulterated, and 2 compound.

Meat extract and similar preparations including studies of the methods of analysis employed, W. D. BIGELOW and F. C. COOK (*U. S. Dept. Agr., Bur. Chem. Bul. 114, pp. 7–56*).—Results of analyses of a large number of samples of meat extracts, meat juices, yeast extracts and similar goods are reported and the analytical results discussed.

The following conclusions were drawn regarding the use and value of this class of food products:

"It is commonly assumed that proteids, gelatinoids, and the similar amids have very different nutritive values, and, while all authorities would agree in assigning the highest value to the first of these, there is probably no small difference of opinion as to the order in which the second and third should be rated. In considering such a question, there should be separately taken into account relative digestibility or solubility, capability of undergoing osmotic absorption, and oxidizabilty for the production of energy. At present, no definite numerical statement of the relative nutritive values of nitrogenous bodies of these three classes can be made. It seems much to be desired that more extended experiments than have so far been recorded should be made upon living animals (as far as possible upon human beings) to determine the utilization of both the gelatinoids and the simpler amids. The latter no doubt undergo oxidation to some extent in the animal body, and produce some energy in consequence. It is probably true of these simpler amidic substances that much larger quantities than analysis exhibits as constituents of the food consumed, or than analysis detects among the residue of food rejected from the body without having undergone complete oxidation, may be constantly formed

among the earlier products of the metabolism of the proteids, and afterwards themselves undergo further change into the simpler and more stable forms of carbon dioxid, water, and urea.

"In the animal body the amido acids are acted upon in two ways; that is, they are converted into the corresponding fixed acids or carbonic acid is split off, leading to the formation of Brieger's diamins, or it is possible for both of these processes to take place. Usually the albumins are converted in the alimentary tract by the four proteolytic ferments (pepšin, trypsin, erepsin, and arginase) into primary crystalline dissociation products, namely, the amido acids, which are absorbed in this form. Whether a part of the albumin taken as food can or can not be absorbed in the form of albumoses, peptones, and peptids remains to be determined.

"Meat preparations of the sort included in this report are largely used by the sick and the young. Their use is recommended frequently by physicians who may not have taken the trouble to ascertain the true nutritive value of the product prescribed. It seems to be the general consensus of opinion among scientific investigators who have studied this question that the food value of these meat extracts is rather limited, and although they are a source of energy to the body they must not be looked upon as representing in any notable degree the food value of the beef or other meat from which they are derived. When prepared under the best possible conditions a commercial meat extract is, of necessity, in order that it may not spoil, deprived of the greater part of the coagulable proteids, which constitute the chief nutritious elements of the juice. It is fair to state that many manufacturers make no claim as to the food value of their preparations, only a comparatively few making extravagant statements as to the nutritive value of these products.

"Preparations of this character are not wholly valueless in the sick room, for they possess stimulating qualities, and in the kitchen they are useful on account of their flavoring properties. They are not, however, concentrated foods, having on the contrary but comparatively little nutritive value. The meat juice prepared from fresh meat, in the home or hospital, by continued heating at a low temperature, is far superior as a food to the commercial meat extracts and so-called meat juices."

Observation on army bread. H. Bischoff (*Ztschr. Hyg. u. Infectionskrank., 59 (1908), pp. 154–160*).—From a consideration of composition, digestibility, wholesomeness, and related questions the author believes that for making army bread it is more economical and satisfactory to use flour with less than the usual content of bran.

The influence of flour and yeast improvers on bread fermentation. A. J. J. Vandevelde and J. Masson (*Separate from Verslag. en Meded. K. Vlaam. Acad. Taal en Letterk., 1907, pp. 29, figs. 2; abs. in Chem. Zentbl., 1908, I, No. 3, p. 282*).—The authors studied several commercial products which are said by manufacturers to assist fermentation and improve the quality of bread. The results indicated that the use of such materials increased the amount of moisture in the bread, hindered rapid drying, and assisted yeast fermentation. So far as artificial digestion experiments showed, bread made with the addition of the materials tested did not differ in digestibility from ordinary bread.

Honey. A. McGill (*Lab. Inland Rev. Dept. [Canada] Bul. 148, pp. 17*).—Of 141 samples collected in December, 1907, 135 were found to be genuine, 3 doubtful, and 2 adulterated, while 1 was sold as compound. "The report now submitted shows that strained honey, as found throughout Canada, is mainly a genuine article, true to name."

The fig. Lucy Doggett (*Amer. Food Jour., 3 (1908), No. 3, pp. 20, 21*).—According to the author's laboratory experience, it is possible to secure dried

figs free from dirt, insects, etc., and the desirability of clean figs is discussed as well as the food value and uses of figs and related topics.

Nuts and their uses as food. M. E. JAFFA (*U. S. Dept. Agr., Farmers' Bul. 332, pp. 7–8, fig. 1*).—This bulletin is a revision and extension of an earlier publication (E. S. R., 19, p. 258). In its present form the bulletin constitutes a summary of available data on the flavor, composition, and digestibility of nuts and nut products and the general subject of nuts and their uses as food.

Olive oil and its adulteration. A. BLAVIA (*Abonos Químicos, 7 (1907), Nos. 80, pp. 193–197; 81, pp. 214–218; 82, pp. 238–243, figs. 2; 83, pp. 262–266, fig. 1; 84, pp. 287–292; 8 (1908), Nos. 85, pp. 4–8; 86, pp. 28–32*).—A summary and discussion of data regarding olive oil and its adulteration.

On the chemical composition of some Australian wines. M. BLUNNO and L. A. MUSSO (*Agr. Gaz. N. S. Wales, 19 (1908), No. 2, pp. 140–145*).—The analytical data reported cover 149 samples. In many cases the ash constituents were determined as a part of the work.

Organic phosphorus in wine. M. SOAVE (*Ann. R. Accad. Agr. Torino, 49 (1906), pp. 109–114*).—A summary and discussion of data on the character of the organic phosphorus compounds of wine.

Lemon extract. T. J. BRYAN (*Amer. Food Jour., 3 (1908), No. 3, pp. 21, 22*).—The author discusses the adulteration of lemon extract and related questions, gives household tests which he considers useful for the detection of such adulteration, and briefly notes the results of the examination of such goods under the State pure-food law.

Salicylic acid for preserving fruit juices. F. W. DAFERT and B. HAAS (*Arch. Chem. Micros., 1 (1908), p. 24; abs. in Chem. Ztg., 32 (1908), No. 27, Report., p. 174*).—In studies of the minimum amount of salicylic acid required as a preservative it was found that 50 gm. per hectoliter of raspberry juice was sufficient.

Influence of food preservatives and artificial colors on digestion and health. IV, Benzoic acid and benzoates. H. W. WILEY (*U. S. Dept. Agr., Bur. Chem. Bul. 84, pt. 4, pp. 1043–1294, figs. 2*).—Full analytical data and other details are reported of investigations on benzoic acid and benzoates. The conclusions have been noted from a previous summary (E. S. R., 20, p. 361).

The social condition of working-class families in Dublin (*Brit. Med. Jour., 1908, No. 2466, pp. 833, 834*).—A summary of investigations carried on by T. J. Stafford and C. D. La Touche into the social conditions and domestic economy of a number of families. Considering 21 families, the average expenditure for food was about $3.20 per week, which provided on an average 98.52 gm. of protein per man per day. Considering only families of unskilled laborers, the amount expended for food was $2.48 per week and the amount of protein obtained 80.6 gm. per man per day. The authors believe that the systematic study of such questions is of the greatest importance.

Dietetics in tuberculosis: Principles and economics. N. D. BARDSWELL and J. E. CHAPMAN (*Proc. Roy. Soc. [London], Ser. B, 80 (1908), No. B538, pp. 151–160*).—In connection with a study of the diet of tuberculosis patients with special reference to the value of animal and vegetable protein, the authors report figures obtained with families under normal conditions which are used for purposes of comparison. They found that the diet of 100 working-class families, regarded as physiologically adequate, furnished 119 gm. protein, 114 gm. fat, 417 gm. carbohydrates, and 3,687 calories of energy per person per day at a cost of 20 cents.

An explanation of the specific dynamic effect of protein. G. LUSK (*Zentbl. Physiol., 21 (1907), No. 26, pp. 861, 862*).—On theoretical grounds the author believes that the specific dynamic affect of protein is due to cleavage which involves the breaking down of the amid radical. If protein is resorbed rather

than broken down such cleavage does not take place and no specific dynamic effect is noted.

Experiments on the effect of gastric and intestinal enzyms on vegetable protein. A. STUTZER and E. MERRES (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 127–162*).—The experiments reported led to the conclusion that the best results were obtained in artificial digestion when digestibility was measured with a satisfactory pepsin solution. Subsequent treatment with alkaline trypsin solution is not regarded as necessary or desirable.

The action of gastric and intestinal enzyms on vegetable protein, A. STUTZER and E. MERRES (*Biochem. Ztschr., 9 (1908), No. 3–4, pp. 244–254*).—A continuation of the authors' comparison of the results of natural and artificial digestion.

According to the data reported, if the feces in natural digestion experiments are subsequently digested with gastric juice the total digestibility agrees very closely with the results obtained in artificial digestion experiments when the feeding stuff is treated with such acid gastric juice. This method, in the authors' opinion, gives without doubt the most reliable data as to the proportion of digestible nitrogenous material in foods and feeding stuffs.

The utilization of different amid bodies by Carnivora, W. VÖLTZ and G. YAKUWA (*Arch. Physiol. [Pflüger], 121 (1908), No. 3–4, pp. 117–149, chart 1*).—According to the authors' experiments with dogs, ammonium acetate, acetamid, glycocoll, and a mixture of these bodies and asparagin increased the resorption of nitrogen, while asparagin alone diminished it slightly or was without effect. The results are also discussed with reference to the gains in nitrogen and the nitrogen balance and the authors conclude that the character of the amid substances exercises a decided influence upon nitrogen metabolism.

The direct utilization of the common sugars by the tissues, H. MCGUIGAN (*Amer. Jour. Physiol., 21 (1908), No. 3, pp. 334–350*).—The living muscles of an animal, according to the author's experiments, when perfused with dextrose, levulose, or galactose cause a rapid oxidation of these sugars. The results obtained with maltose did not indicate any direct oxidation by the muscles. The perfusion of dead muscles showed practically no loss of sugar.

Other questions were also considered in this experimental inquiry, which is a contribution to the question of the way in which the animal body utilizes a carbohydrate food supply.

Studies of diastase, J. WOHLGEMUTH (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 10–43*).—The following are some of the conclusions drawn from the author's experimental work: The quantity of diastatic ferment in human saliva varies markedly. Usually more diastase is present after taking food than otherwise but sometimes these conditions are reversed. The kind of food seems to be without effect on the quantity of diastase present. On an average, sodium chlorid was found to increase the diastatic power of saliva about ten times in a 24-hour digestion period.

Metabolism experiments with healthy children and children with rickets with special reference to mineral metabolism, W. CRONHEIM and E. MÜLLER (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 76–126*).—The results, which have to do with the metabolism of nitrogen and fat in healthy children, were favorable to sterilized milk. In the case of calcium no better results were noted with raw than with sterilized milk. The authors believe that the unfavorable results sometimes noted with sterilized milk are due to conditions not yet understood.

Experiments on the metabolism of calcium, magnesium, and phosphorus in fasting animals, O. WELLMANN (*Arch. Physiol. [Pflüger], 121 (1908), No. 8–10, pp. 508–533*).—The authors studied the metabolism of mineral matter with Herbivora (rabbits) and found that bones lost about 14 per cent of their weight

during fasting, of which about half was fat. Analyses of the bone showed that practically all the calcium and phosphorus lost during the fasting period came from bone substance.

The utilization by the growing animal of calcium in different forms, H. Aron and K. Frese (*Biochem. Ztschr., 9 (1908), No. 1–2, pp. 185–207*).—Growing dogs, it was found, utilized calcium in the form of tertiary calcium phosphate, which is difficultly soluble, as readily as in the form occurring in milk. Sterilizing milk was found to be without influence on calcium metabolism and gains. In general, over 80 per cent of the calcium supplied was utilized.

Observations on the rectal temperature after muscular exercise, M. Flack (*Brit. Med. Jour., 1908, No. 2468, pp. 921, 922*).—A marked rise in temperature was noted in a number of subjects after muscular exercise.

ANIMAL PRODUCTION.

The composition of green maize and of the silage produced therefrom, H. E. Annett and E. J. Russell (*Jour. Agr. Sci., 2 (1908), No. 4, pp. 382–391*).—Analyses of fresh green fodder and silage were made with a view to studying the changes brought about by ensiling. The crude fiber content was found to be practically unchanged and this opinion was confirmed by microscopical analysis. The epidermal cells, according to the author, had undergone no change in the silo beyond a certain amount of shrinkage, even the stomata being unaltered. The vascular bundles were also intact. The greatest change was noted in the nitrogen-free extract, direct tests showing that the sugar disappears almost entirely.

The observed decrease in furfurol "indicates a decrease in the amount of cellulose, i. e., the less resistant cellulose, which alone falls into this group; this was confirmed by microscopic examination which showed that many of the cells of the mesophyll were completely disintegrated.

"The protein suffers considerably, though not in reality as much as the nitrogen-free extract. Hydrolytic decomposition complicated by bacterial action takes place, and although there is not much, if any, loss of free nitrogen the new nitrogenous compounds are less valuable as food than the protein.

"The figures show an absolute loss of nitrogen, but we are satisfied that a certain amount of ammonia is given off during sampling, and we have no evidence to show how or to what extent losses of nitrogen occur in the silo. In laboratory experiments on silage made in bottles we only observed losses of nitrogen when air was admitted, and this did not happen in the silo."

The values obtained for ether extract the authors consider influenced by accidental variation, since this constituent contains a number of soluble acids which obviously wash downward in the silo. A similar factor influences the soluble ash content though not the insoluble ash constituents. During the process of ensiling carbon dioxid is evolved and a number of acids appear which were not present at the beginning of the process. According to the authors the general nature of the losses outlined is probably the same in all silos though the actual amount varies. "Our losses are higher than those observed by American investigators, but there is considerable difference between American and English maize at the time of cutting; ours is much less mature, and contains a lower proportion of nitrogen-free extract."

The chemical changes taking place during the ensilage of maize, E. J. Russell (*Jour. Agr. Sci., 2 (1908), No. 4, pp. 395–410*).—The author summarizes the results of investigations as follows:

"The main groups of compounds found in maize silage are fatty acids, hydroxy acids, amino acids, basic diamino acids, purin bases, and other bases,

besides the ordinary constituents of the plant cell, the celluloses, protein, etc. The nonnitrogenous acids are not found in maize at the time of cutting, and the nitrogenous acids, though they are found, occur to a smaller extent than in silage.

"The characteristic silage changes are the disappearance of sugar, of some less resistant celluloses, and of part of the protein, and the formation of the bodies enumerated above.

"Three agents appear to be involved in making silage—the living maize cell, the enzyms, and micro-organisms. It is considered that the two former bring about the primary and essential changes, the latter only secondary and nonessential changes.

"The formation of acetic and butyric acids appears to be a respiration effect, and comes about when the living cell is deprived of oxygen. Sugar disappears during the process.

"The decomposition of the protein and nucleo-protein is effected by enzyms present at the time of cutting the maize, which can go on acting in the silo even after the cell is dead. Characteristic products of protein hydrolysis were identified in the silage.

"These are regarded as the primary and essential changes.

"Bacteria are, however, always present, and attack the less resistant celluloses, the products of protein hydrolysis, and no doubt other substances as well, but not the resistant fiber. Typical products of bacterial activity were found—formic acid, higher fatty acids, humus, and amins.

"The growth of mold is inhibited except at the surface layer where air gets in. Here the changes are fundamentally different; there is no development of acetic or butyric acids, the mass is alkaline, nonprotein material already existing in the maize is converted into protein, and there is also a loss of nitrogen."

Analyses of a mixture of red clover and timothy forage, A. Grégoire and E. Carpiaux (*Bul. Inst. Chim. et Bact. Gembloux, 1908, No. 75, pp. 109, 110*).—A proximate and ash analysis is reported.

On the composition of rice straw, T. Takeuchi (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 619–621*).—From the analyses reported, the conclusion is drawn that straw from rice plants producing a poor crop is somewhat richer in protein, fat, and carbohydrates than is the case when the yield is better.

Fodders and their nutrient values, C. F. Juritz (*Agr. Jour. Cape Good Hope, 32 (1908), No. 1, pp. 99–101*).—Analyses of Vlei grass, ground corncob and corn are reported. As the author points out, the food value of the corncob is about one-third that of the corn analyzed and is also inferior to wheat bran.

Examination of feeding stuffs, C. Aumann (*Ber. Landw. Vers. Stat. Hildesheim, 1907, pp. 6–11, 14*).—A brief report of the examination of a large number of samples of commercial by-products, cereal grains, meat meal, and other feeding stuffs.

Examination of feeding stuffs, H. Immendorff (*Ber. Landw. Vers. Stat. Univ. Jena, 1907, pp. 10–14*).—A brief report of the examination of a number of samples of concentrated feeds and other feeding stuffs, of "futterkalk" and similar materials.

Brief statements are also made regarding samples of milk and dairy products which were analyzed at the station.

Feeding stuff analyses, E. Haselhoff (*Jahresber. Landw. Vers. Stat. Marburg, 1907–8, pp. 10–16*).—Data are reported regarding the composition of feeding stuffs examined at the station.

New feeding stuffs, J. V. de Paula Nogueria (*Gas. Aldeias, 1908, No. 657; abs. in Bol. R. Assoc. Cent. Agr. Portuguesa, 10 (1908), No. 8, pp. 487–495*).—

Analyses of two commercial feeds, one a molasses feed, are reported and discussed with reference to Portuguese conditions.

The digestibility of dried beet pulp, E. Baeck (*Sucr. Indig. et Colon., 71 (1908), No. 17, p. 451*).—In a paper presented at the Second International Congress of Sugar and Fermentation Industries, the author summarizes experimental data which in his opinion show that drying increases the digestibility of the pulp.

The use of olive marc for cattle feeding, A. Guyader (*Bul. Dir. Agr. Com. et Colon. [Tunis], 12 (1908), No. 46, pp. 122–126*).—On the basis of analytical data reported in comparison with other feeding stuffs, the author believes that olive marc is a valuable feed. The olive marc may be readily dried and ground.

Patent horsebread, H. H. Morgan (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3282, p. 11*).—A brief account of a patent feed for horses which is marketed in cake form and is said to be particularly rich in phosphoric acid and lime in addition to the usual feed constituents.

Beer yeast as a feeding stuff, E. Pott (*Illus. Landw. Ztg., 28 (1908), No. 33, pp. 295, 296*).—Data regarding the composition and feeding value of yeast and yeast feeds are summarized and discussed.

Notes from the chemical laboratories, H. Ingle (*Transvaal Agr. Jour., 6 (1908), No. 23, pp. 426–428*).—Ground nut cake, wild plums, pearl millet, and sunflower seed were analyzed with special reference to oil making in the case of the plums and sunflower seed. The plum pits, if dried, would, according to the author, contain 38.1 per cent oil.

Concerning spoiled peanut cake, A. Grégoire, Hendrick, and E. Carpiaux (*Bul. Inst. Chim. et Bact. Gembloux, 1908, No. 75, pp. 44–65*).—In all the spoiled peanut cakes examined sugar was less than 6 per cent of the total organic matter exclusive of fat, and acidity was greater than 60 per cent measured as oleic acid.

Do ptomaines and toxins occur in animal meal? Haefcke (*Ztschr. Fleisch u. Milchhyg., 18 (1908), No. 8, pp. 245–253*).—Although the author was able to identify, in decomposed meat and bone, ptomaines which have previously been found, as well as new amino bases not hitherto reported, he was not able to identify any specific ptomaine in such animal material which had been sterilized after spoiling.

[Sex and birth weight of calves], C. L. Beach (*Connecticut Storrs Sta. Rpt. 1907, pp. 146, 147*).—A table shows the yearly proportion of sexes in the college herd. "During the 10 years, from 1897 to 1906, 201 calves were dropped, of which 41.3 per cent were female and 58.7 per cent were male." In a small flock of Dorset sheep the number of ram lambs was largely in excess. The weight of the calves at birth was, in general, proportioned to the weight of the dams. The average daily foetal growth ranged from 0.38 lb. with Holstein calves to 0.22 lb. with calves from Jersey heifers.

Calf raising, B. R. Jonas (*Wiener Landw. Ztg., 58 (1908), No. 42, p. 436*).—The author studied the body development of calves fed with and without access to pasture, taking into account body measurements and gains in weight. His conclusion is that calves with pasture show the most satisfactory development.

Whole milk compared with skim milk alone and supplemented by other feeds in calf feeding, G. Fingerling (*Landw. Vers. Stat., 68 (1908), No. 3–4, pp. 141–188*).—In the experiments reported the gains in weight and the metabolism in nitrogen were the same on skim milk as on whole milk but the skim milk did not have the same satisfactory dietetic properties as the whole milk. In the author's opinion, milk fat is of value not only as a nutrient but also for its dietetic properties.

Peanut oil emulsion, flaxseed, and starch were used for supplementing skim milk and the best results, according to the author, were obtained with flaxseed, though good results were also obtained with the peanut oil emulsion provided the quantity was not too large. When the skim milk was supplemented by cooked starch the digestive disturbances were as great as noted on skim milk alone.

No conclusions could be drawn from the experimental data regarding the effect of different rations on the quality of the meat produced.

Feeding of the Angus steer Andy, A. Boss (*Breeder's Gaz., 53 (1908), No. 18, pp. 1005, 1006, figs. 4*).—A summary of data regarding the feeding of this champion steer at the Minnesota Agricultural College.

In general the amount of grain was smaller than is recommended by many feeders and large amounts of succulent feed were supplied, roots or silage being used when the steer was not on grass. No molasses or condimental stock feed was used at any time. The average gain in the 2 years was in one 4 week period as high as 3.57 lbs. per day. The steer weighed 1,780 lbs. when slaughtered, the dressed weight after a month in cold storage being 68.6 per cent of the live weight. The flavor of the meat was excellent and the carcass was of fine texture and marbling throughout.

Study of draft oxen in Tunis. G. Barrion and R. Gagey (*Bul. Dir. Agr. Com. et Colon. [Tunis], 12 (1908), No. 46, pp. 103–111*).—The studies reported are not favorable to the draft oxen used locally and the authors recommend raising improved breeds.

A dynamometer for experiments with steers, R. Gagey (*Bul. Dir. Agr. Com. et Colon. [Tunis], 12 (1908), No. 46, pp. 112, 113, fig. 1*).—The author describes a dynamometer used in tests with draft oxen.

Studies of the milk secretion of pigs and the feeding of young pigs, R. Ostertag and N. Nuntz et al. (*Landw. Jahrb., 37 (1908), No. 2, pp. 201–260*).—Some of the conclusions which were drawn from the extended series of investigations reported follow: The milk yield and the fat and protein content of swine milk are much greater than has been hitherto supposed, a sow weighing 150 kg. yielding 4 to 8 liters of milk per day, containing 45 to 90 gm. nitrogen and having an energy value of 7,000 to 14,000 calories.

The food requirement of sows is not greater than the maintenance requirement plus the material necessary for the milk yield. The work of the milk glands apparently does not require any considerable energy expenditure.

Nursing pigs utilize 60 to 80 per cent of the energy of the milk eaten and as much as 70 per cent of the nitrogen content. Gains in nitrogen diminish more than gains in fat as the period of lactation progresses. When the same amount of nitrogenous material is taken after weaning as before, pigs make as large gains in weight, the protein gains being even greater than during the latter part of the period before weaning. To secure the greatest gains after weaning, the nitrogen ratio must not be greater than 1:4 and the proportion of easily digestible carbohydrates must be much greater than fat. Inverting part of the carbohydrates with diastase did not have a favorable effect except immediately after weaning. Homogenized milk was found to be as satisfactory as whole milk and cheaper.

No conclusions could be drawn regarding the effect of the different rations on resistance to infection.

Forage crops for hogs in Kansas and Oklahoma, C. E. Quinn (*U. S. Dept. Agr., Farmers' Bul. 331, pp. 5–24*).—A revision of an article previously noted (E. S. R., 19, p. 569).

Potatoes supplemented by different quantities of protein for pig feeding, Münzinger (*Deut. Landw. Presse, 35 (1908), Nos. 8, pp. 75, 76; 9, pp. 87, 88, figs.*

4).—Greater gains were made on the ration containing the larger amount of protein. Differences in quality of the meat produced were not noted.

Different quantities of skim milk with supplementary feeds for pigs, J. KLEIN (*Milchw. Zentbl., 3 (1907), No. 4, pp. 137–149*).—Four lots of 2 pigs each were used in a test covering 21 weeks, in which varying amounts of skim milk were fed with barley and dried beet pulp or potato flakes, one of the lots receiving some fish meal also. Marked differences were not noted with the several lots with respect to the gains in weight, the ratio of the dressed weight to live weight, the quality of the meat, or the character of the fat.

Construction of pig-sty buildings, A. BROOKS (*Agr. Gaz. N. S. Wales, 18 (1907), Nos. 8, pp. 663–667, figs. 5; 11, pp. 856–862, figs. 11; 19 (1908), No. 1, pp. 30–36, figs. 11*).—The construction and equipment of pig sties are discussed with special reference to local conditions and requirements.

Feeding work horses. A comparison of corn and oats, B. E. CARMICHAEL (*Ohio Sta. Bul. 195, pp. 245–263, figs. 9, dgms. 2*).—The tests reported were undertaken to test the widespread belief that oats are superior to other grain as a feed for horses. Six mature grade Percheron geldings were fed on a basal ration of clover and timothy hay, three receiving oats and three corn as a supplementary ration. Estimating corn to be worth 40 cts. per bushel, oats 30 cts. per bushel, and the hay $8 per ton it was found that the average cost of food per hour of work was 3.3 cts. for the corn-fed horses and 4.54 cts. for those fed oats.

The use of corn to the exclusion of other grain for a period of 48 weeks was not found detrimental to the health of work horses and they endured hard work during the hot weather as well as those receiving oats. When mixed (clover and timothy) hay was fed to mature geldings at general farm work, ear corn was practically as efficient, pound for pound, as oats. On the basis of the results of this experiment and statistical records of farm values of grains, corn has since 1866 been cheaper than oats as a grain feed for work horses.

A drop in weight of the corn-fed horses coincident with the beginning of the use of shelled corn indicates that ear corn is to be preferred above shelled corn for work horses.

Saving corn fodder as horse feed (*Breeder's Gaz., 54 (1908), No. 11, p. 437*).—Corn fodder, it is stated, may be fed to horses, but one-third of the bulk of the ration should be made up of some other material, preferably red clover or alfalfa. Care must be taken to avoid soft corn, which is injurious to horses, therefore stripping off the ears before feeding is recommended. Shredding is not regarded as necessary or desirable.

The metacarpus of carriage and draft horses with particular reference to its strength, A. WOLTER (*Landw. Jahrb., 36 (1907), No. 3, pp. 485–568, figs. 34*).—The author made measurements and tested the strength of the metacarpal bones of the front legs of carriage and heavy horses. The absolute weight of the metacarpal bone in heavy horses is 30 per cent greater than that in light horses and its volume 23 per cent greater. The metacarpus of the heavy type of horse is somewhat flatter than that of the race horse. The relative measurements of the metacarpus show such a great individual variation that no racial distinctions can be set up. The absolute carrying strength of the metacarpus in draft horses is 31 per cent greater than in carriage horses.

Horses—breeding to color, W. GILBEY (*London, 1907, pp. VI+45, pls. 6*).—The author has endeavored to explain the cause of different colors in horses and the reason for the increasing frequency of some colors and the decrease of others. Suggestions are also offered as to how horses may be bred to color.

Feeding experiments with chickens, cockerels, and turkeys, J. W. BOLTÉ (*Rhode Island Sta. Bul. 126, pp. 125–139, pls. 3*).—To compare the effect of

different concentrates with and without bone-forming constituents for winter chickens, 7 lots each consisting of 34 White Wyandottes 2 weeks old were fed a basal ration of mixed grain, clover, and grit, supplemented by animal meal, cotton-seed meal, gluten feed, or granulated milk. Three of these lots also received bone ash and pure calcium carbonate sufficient to bring up the calcium and phosphorus content essentially to that in the ration including animal meal. The test was divided into two periods, the first lasting 28 days and the second 35 days.

During the first period the food required per pound of gain was as follows: On animal meal 3.29 lbs., on cotton-seed meal 9.8 lbs., on cotton-seed meal plus the bone-ash and lime 5.3 lbs., on Buffalo gluten feed 9.92 lbs., on Buffalo gluten feed plus bone-ash and lime 4.39 lbs., on granulated milk 4.1 lbs., and on granulated milk plus bone-ash and lime 3.18 lbs. During the second period the amounts required were respectively 4.52, 9.87, 5.74, 9.05, 5.16, 5.78, and 4.19 lbs. The percentages of deaths from digestive troubles were respectively as follows: 12, 62, 50, 59, 3, 9, and 6. The author states that the data seem to indicate that phosphorus and lime appear to be as necessary as protein, and that cotton-seed meal can not be recommended as a food for chickens in any considerable proportion.

Twenty-four cross-bred Plymouth Rock cockerels were used to test the advisability of fattening late hatched chickens by feeding with a machine. During a period of 21 days those trough-fed made an average gain of 0.61 lb. at a cost of 17.4 cts. per pound. Those trough and machine fed gained 0.75 lb. at a cost of 15.9 cts. per pound. It is concluded that late hatched staggy cockerels confined in slatted coops can be fed a fattening ration for 3 weeks with profit.

"A combination of trough and machine feeding proved superior to trough feeding alone. Chickens fed in this manner gained, on the average, 23 per cent more, and at 9 per cent less cost for feed per pound of gain, than when fed wholly in the trough. The cost of labor, however, is doubled while using the cramming machine for small numbers of chicks.

"In the absence of skim milk to mix with the grain, some other animal concentrate should be supplied. The ration containing 10 per cent of animal meal gave a much greater gain than rations containing either no animal meal or 20 per cent of animal meal. The cost of feed per pound of gain was lessened one-third under the same conditions."

A turkey fattening experiment is reported as seeming to indicate that:

"For a short feeding period there is not sufficient advantage in using a wet mash of mixed grains, at the prices quoted, to warrant the turkey fattener in adopting the ration.

"While the feeding of a mash partly in the trough and partly with the cramming machine gave the greatest average gains at the least cost for feed, the added outlay for labor over feeding corn on the range would make the latter method more profitable.

"Heavy feeding may hasten the development of the 'blackhead' disease, if it is already present in the system."

The experiment was terminated at the end of 10 days by the appearance of "blackhead."

Experiments on the metabolism of matter and energy during incubation of hens' eggs, F. Tangl and A. von Mituch (*Arch. Physiol. [Pflüger], 121 (1908), No. 8–10, pp. 437–458*).—According to the authors' observations an egg weighing 54.2 gm. contained before incubation 36.8 gm. water, 12.14 gm. dry matter, 5.68 gm. fat, and 0.929 gm. nitrogen, and had an energy value of 86.85 calories. At the time of hatching the chick weighed 28.8 gm. and 6.9 gm. egg yolk remained unused.

According to the analytical studies reported, 61 calories, or two-thirds of the energy value of the total egg was required in the incubation process, of which 23 calories was used for the development of the chick and measurable as heat, and 38 calories was represented by the material in the chick's body. The egg yolk remaining unused at the time of hatching had an energy value of 26 calories or about one-third of the amount originally present.

The values, therefore, per gram body weight of the chick would be 0.805 calorie manifested as heat, that is, "relative energy of development," and 3.6 calories per gram dry matter, for body development, that is, "specific energy of development."

The energy required for development is largely supplied by the egg fat. No nitrogen is lost during incubation, according to the authors, at least none could be measured in their experiments.

The assimilation of phosphorus and calcium by the chicken embryo, E. Carpiaux (*Acad. Roy. Belg., Bul. Cl. Sci., 1908, No. 3, pp. 283–295; abs. in Chem. Zentbl., 1908, II, No. 4, p. 337*).—In continuation of earlier work (E. S. R., 15, p. 64) the author studied the calcium and organic and inorganic phosphorus content of eggs at different stages of incubation and found that as the embryo develops the calcium and inorganic phosphorus of the egg increases while the lecithin is correspondingly diminished. According to the observed data the chicken uses almost entirely the phosphorus of lecithin for building its body and does not make use of the phosphorus in the egg-shell. On the other hand, the shell furnishes more than 80 per cent of the necessary calcium.

Carbon dioxid under sitting hens, H. D. Edmond (*Connecticut Storrs Sta. Rpt. 1907, pp. 157–162*).—Using a modification of Pettenköfer's titration method, the author found that the carbon dioxid under hens sitting on good eggs in March ranged from 3.8 to 22.5 parts by weight in 10,000 parts of air while the proportions in the air of the barn ranged from 2.8 to 5.2. Under a hen sitting on china eggs the range was from 3.4 to 8.5. In tests in July, made by a somewhat different method, the percentages of carbon dioxid under hens were much higher than in March, ranging from 5.3 to 12.0 with china eggs and from 9.0 to 80.1 parts per 10,000 of air with good eggs.

In an incubator samples of air were drawn by an aspirator from over the egg tray, the parts of carbon dioxid ranging from 4.8 to 29.5. Oats was sown in one pan to test the effect on the air of the incubator of the carbon dioxid given off by sprouting seed, but no noticeable difference was found.

"Whether carbon dioxid is essential to a perfect hatch and vitality in a chick is still an open question. This work is not complete enough to settle the question and there is very little data to be found on this subject. It is true that there is a much larger percentage of carbon dioxid under sitting hens than in an incubator. It is also true that hens hatch chickens with greater vitality than an incubator."

Incubation experiments, J. Dryden (*Oregon Sta. Bul. 100, pp. 3–32, figs. 6*).—A series of investigations was started to test the relative efficiency of natural and artificial incubation and to discover improvements in incubation and brooding.

"From 879 eggs set, incubators hatched 533 chicks, or 60.6 per cent. From 279 eggs, hens hatched 219 chicks, or 78.8 per cent. Eliminating eggs broken in nests, the hens hatched 88.2 per cent of eggs set. The incubators hatched 78.5 per cent of 'fertile' eggs, and the hens hatched 96.5 per cent.

"Eggs incubated artificially tested out 22.7 per cent as infertile, while those incubated by hens tested out 11.8 per cent. The incubators showed 16.6 per cent of chicks 'dead in the shell,' and the hens 2.8 per cent.

"Chicks hatched under hens weighed heavier than chicks hatched in incubators.

"The mortality of hen-hatched chicks brooded in brooders was 10.8 per cent in four weeks, and of incubator-hatched chicks 33.5 per cent. The mortality in hen-hatched chicks brooded under hens was 2.2 per cent, and of incubator chicks 49.2 per cent. In other tests the mortality was 46.5 per cent for incubator chicks brooded by hens and 58.4 brooded in brooders.

"Hen-hatched chicks made greater gain in weight than incubator chicks, whether brooded by hens or brooders."

Moisture tests were made in which incubators were operated according to the directions of the makers with the exception that moisture was used in different amounts. In the machines with "no moisture" a tray of dry sand, corresponding to the tray in the "maximum moisture" machines was kept under the egg tray. The sand in the "maximum moisture" machines was kept wet all the time, or as wet as it could be kept without the water standing on top of the sand. The "medium moisture" machines had a tray of sand half the size of the other trays.

"There was an increase in number of chicks hatched of 32.6 per cent by using moisture in incubators.

"The wet-bulb thermometer may be used to advantage as an indicator of the proper degree of humidity in the incubator. An average wet-bulb temperature of 87.6 gave 32.6 per cent better hatches than one of 84.5, and slightly better than one of 91.

"The lack of moisture does not alone explain the great mortality in incubator chicks, but it is responsible for a large percentage of the losses in hatching."

The amount of oil on egg shells was determined by washing the surface of the shell with a jet of ether and evaporating. The residue was dried in a dessicator and weighed, with the following results: 12 fresh hen eggs, 3 mg. oil; 12 china eggs, 2 weeks under hen, 3 mg.; 12 hen eggs, 2 weeks under hen, 28 mg.; 12 hen eggs, 2 weeks in incubator, 4.6 mg. This oil is considered a natural secretion from the hen, but its function has not been determined.

Appliance and methods for pedigree poultry breeding, R. Pearl and F. M. Surface (*Maine Sta. Bul. 159, pp. 239–274, figs. 13*).—Descriptions are given of a trap nest, an egg distributing and turning table, pedigree incubator baskets, a chick leg band bender, and a system of keeping pedigree records, devised by the station. It is stated that by making slight changes in detail the system of pedigree records can be adapted to keeping pedigree records in breeding work with either plants or animals.

Chicks: Hatching and rearing, H. A. Nourse et al. (*St. Paul, Minn., 1907, pp. 126, pl. 1, figs. 44*).—Incubation, brooding, feeding, housing, fattening, killing and marketing chickens, and other questions are discussed in this popular summary.

Egg money: How to increase it, H. A. Nourse et al. (*St. Paul, Minn., 1907, pp. 128, pl. 1, figs. 44*).—A summary of information on raising poultry for egg production in cities and villages, as well as under farm conditions.

Experiments with ostriches, J. E. Duerden (*Agr. Jour. Cape Good Hope, 32 (1908), No. 6, pp. 713–721*).—The best time in which to quill ostriches, the author concludes, involves considerations of the age of the bird, its physical condition, and climatic conditions.

"The first quilling must be carried out when the chicks are about eight months old, otherwise irregularities will be introduced by the uneven growth of the new second crop, some feathers of which can not be kept back by allowing the quills to remain in their follicle.

"The extraction of a quill at once stimulates the growth of a new feather, quite irrespective of any natural order of appearance of the feather, and thus evenness of growth can be secured by simultaneous quilling.

"The second quilling may take place at about sixteen months, at which time the quills are ripe; but under certain conditions the operation can be delayed for several months longer.

"The quills of the second and later quillings may be left for many months within the socket, even after they are ripe, provided the birds are not in a high nutritive condition; otherwise some feathers of the new crop will appear and thus produce irregularities.

"Eight month and twelve month systems of quilling are very largely practiced according to climatic conditions, though both systems admit of considerable variations."

For earlier work, see E. S. R., 19, p. 1072.

Egg-laying records of ostriches, J. E. DUERDEN (*Agr. Jour. Cape Good Hope, 32 (1908), No. 4, pp. 449–453*).—Four series of egg-laying records for lots of 1 cock and 2 hen ostriches are given, extending over a period of 4 months. The eggs were removed daily and artificially incubated. The maximum per hen was 100 eggs in 122 days.

"The numbers show that ostriches, like poultry, will go on laying almost continuously during the breeding season if the eggs are removed as laid, and the birds are not allowed to sit. The records afford very clear proof that breeding birds are adversely influenced by inclement climatic conditions to such a degree that the laying of eggs may cease entirely for a time."

The influence of environment generally upon egg-production and also the possibility of an increased yield are briefly discussed.

DAIRY FARMING—DAIRYING.

Experiments in feeding dairy cows, J. S. MOORE (*Mississippi Sta. Bul. 111, pp. 6*).—This bulletin gives results of a number of experiments in the care and feeding of dairy cows. Experiments lasting 16 and 10 weeks, respectively, were undertaken to see if it paid to feed cotton-seed meal when cows had an abundance of green feed. In the former test the cotton-seed meal gave 5 per cent better returns, but this was not enough to pay for the extra cost of the meal. In the second test there was no increase in the yield of milk.

Using cows pastured at night but kept up during the day, cotton-seed meal was fed at the barn in comparison with the soiling crops, alfalfa, sorghum, and Johnson grass. In a 10 weeks' test it was found that 41 lbs. of green feed gave an average daily yield of 14.9 lbs. of milk for each cow, while the lot fed 3.4 lbs. of cotton-seed meal gave 14.2 lbs. The difference in favor of green feed would have been greater if the cows had had no access to pasture.

In a comparison of large, medium, and small rations with three lots of cows, receiving respectively 13 lbs., 10 lbs., and 6 lbs. of a grain ration consisting of wheat bran and cotton-seed meal 2:1, the average weekly yields were 833, 873, and 743 lbs. In the last case there was also some loss of body weight. A second test with three lots of 9 cows each showed that 9 lbs. of the mixture yielded better results than 11 lbs.

In a test for 4 months with 30 cows it was found that silage resulted in a saving of $100 over a feed of wheat bran, cotton-seed meal, and Johnson grass hay.

During hot weather it was found to be of no advantage to protect cows from the heat by keeping them in the barn, as they were more contented in a shady pasture.

Shelter was found to be unnecessary for dairy cows during the month of February, 1906. It is stated, however, that during this test the weather was extremely mild for that season of the year.

Silage v. hulls and meal. A. K. RISSER and R. R. WELCH (*Mississippi Sta. Bul. 112, pp. 2–8*).—In order to present results obtained from the use of silos, herd records of several farms were collected by the station in cooperation with the Dairy Division of this Department. All cows in the test had practically the same ration in the summer months of May, June, and July, i. e., pasture supplemented with cotton-seed meal. During the winter months of November, December, and January 7 herds containing a total of 247 cows were fed a dry ration, principally hulls and cotton-seed meal, with some bran, shorts, and alfalfa, while the eighth herd of 23 cows was fed corn silage and cotton-seed meal.

Milk and butter fat production with silage and dry feeds.

	Average pounds of milk per cow per month.		Average pounds of butter fat per cow per month.		Average cost of feed per cow per month.	Average cost of 1 gal. of milk.	Average cost of 1 lb. of butter fat.
	Summer.	Winter.	Summer.	Winter.			
Dry-fed herds	357.9	240.4	[a]17.12	[a]12.09	$4.10	$0.1468	[a]$0.2993
Silage-fed herds	364.9	335.9	17.58	16.70	3.50	.0895	.2098
Differences	7.0	95.5	.46	4.61	.60	.0573	.0895

[a] Average of 149 cows.

Notes relative to the construction of silos are given.

Modern feeding standards for milch cows. N. HANSSON (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 1–2, pp. 57–73*).—A discussion of the feeding standards of Wolff (1874), Julius Kühn (1897), C. Lehmann (1899), Maercker (1902), Pott (1904), Kellner (1905 and 1906), and those of the author (1902), founded on the experience of Swedish dairy test associations. The author has devised a system of feed units for the use of Swedish dairymen, which he discusses in detail.

Report of dairy test associations in Norway, 1906–7. L. FUNDER (*Christiania, 1908, pp. 78*).—The report shows that 132 different associations were in existence during the year, including 22,764 cows in the aggregate. The average production of milk was 2,026 kg. per cow, 100 kg. being produced for every 70.3 feed units (each equal to 1 kg. hay) eaten. Fat determinations in the milk of the cows were made in the case of only 38 associations. The average fat content in the milk, according to the results obtained at the milk control stations for 1906, was 3.48 per cent.

Milk and butter yields of heifers compared with mature cows. C. L. BEACH (*Connecticut Storrs Sta. Rpt. 1907, pp. 142–145*).—Tables are given summarizing official records of 3,098 Holstein-Friesians and 400 Guernseys, classified according to the age of the animals. In the Holsteins "the quality of milk is quite uniform for animals of different ages. The milk of 2-year-old heifers contained 0.2 per cent less of butter fat than that of cows in the mature 5-year-old form." The calculated butter fat yield in 7 days at even age of 2 years is 9.05 lbs., at 3 years 11.31 lbs., at 4 years 13.22 lbs., and at 5 years 14.35 lbs. The average yearly yield of butter fat of the Guernseys for the 2-year-old class was 352.8 lbs., the 3-year-old class 403.9 lbs., and the 4-year-old class 433.5 lbs. The mature form class (5 years old and over) averaged 455.7 lbs.

Milk from different breeds (*Connecticut Storrs Sta. Rpt. 1907, pp. 152–156*).—Analyses are reported of the milk of 23 cows, representing 4 different breeds, for the first 10 months of lactation.

Cattle of the Oldenburger Wesermarsch, P. Cornelius (*Das Oldenburger Wesermarschrind. Hannover, 1908, pp. VIII+140, pls. 7, figs. 56, maps 2*).—An account of the development of the cattle industry in this region. Special attention is devoted to dairy cattle and the dairy industry.

Studies of the dairy industry in France, England, Belgium, Denmark, Sweden, and Holland, A. Reitz (*Milchwirtschaftliche Studien über Frankreich, England, Belgien, Dänemark, Schweden, Holland. Stuttgart, 1907, pp. 228, pls. 7, figs. 48*).—The basis of this information was statistics and travels of the author.

Establishment and management of the dairy farm, G. K. Kelkar (*Dept. Agr. Bombay Bul. 31, pp. 12*).—A bulletin of general information on the cost of equipping and methods of managing an Indian dairy farm. Tables show the rations fed and the cost of feeding buffaloes and the dairy breeds of India.

Dairying in the Argentine, L. T. MacInnes (*Agr. Gaz. N. S. Wales, 19 (1908), No. 8, pp. 673–677; N. Y. Produce Rev. and Amer. Cream., 1908, Oct. 7, p. 902*).—Dairying is an adjunct to stock raising and by the large owner is done on the share system. Modern methods are of recent growth. Skim milk is manufactured into casein and exported to England to be made into knife handles, buttons, and other products. An increase in Argentine dairy exports is not expected until present methods are changed.

Report of Alnarp Agricultural and Dairy Institute and of Alnarp Agricultural School and Farm, 1907 (*Berättelse om Verksamheten vid Alnarps Landtbruks och Mejeriinstitut samt Alnarps Landtbruksskola och Egendom år 1907. Malmö, 1908, pp. 49+XVIII, fig. 1*).—A report of the operations of this institution during 1907.

Handling and marketing of milk and cream, J. Michels (*North Carolina Sta. Bul. 198, pp. 4–24, figs. 13*).—This bulletin treats of cream shipping cans, sterilizers, ice boxes, and other appliances used in handling and marketing milk and cream, together with plans for dairy houses and some general information on producing sanitary milk and cream.

In comparing different types of cream shipping cans the results obtained show that so far as maintaining temperature was concerned there was practically no difference in the 20 gal. insulated metallic, the 20 gal. insulated wood jacketed, and the 10 gal. felt jacketed can. Where low temperatures are to be maintained for 9 or more hours during warm weather the ordinary 10 gal. can placed inside of a covered ice-cream shipping tub that allows ice to be packed around the can, including the neck, is deemed the most satisfactory. The ice should be left coarse, and the amount needed will vary with the outside temperature and length of time in transit. The wooden tub without ice has practically the same insulating effect as the felt jacketed.

The bulk of the milk in the State is sold to consumers without any cooling whatever. To show what cooling will do, tables are given showing the acidity of milk at different ages. When milk was kept at a temperature ranging between 42 and 45° F. there was only a slight development of acidity. The morning milk kept at these temperatures showed an average increase of acidity of only 0.05 per cent during 24 hours.

A cheap and effective ice box is described. The author has also devised an effective sterilizer for cleansing vessels and appliances used in handling milk that costs only one-third as much as those commonly used. An improved cooling arrangement is described, wherein the ice water from the cooler is pumped

back into the ice water storage, thereby resulting in a saving of water, ice, and time. It took 35 lbs. of ice 41 minutes to cool 42 gal. of milk to 45° F. when the pump was used, as compared with 89 lbs. of ice and 88 minutes without the pump.

The preservation of milk, L. Eberlein (*Pure Products, 4 (1908), Nos. 9, pp. 390–394; 10, pp. 442–446*).—A discussion of the bacterial content of milk under different conditions, with tables showing the number of bacteria per cubic centimeter. By strict attention to cleanliness a milk containing few germs may be obtained. Various methods of handling milk are described, together with methods of preserving milk by chemical means, including the Budde method of using hydrogen peroxid.

On the changes occurring in milk on heating, O. Jensen (*Malkeritid., 21 (1908), No. 19, pp. 365–368; Norsk Landmandsblad, 27 (1908), No. 28, pp. 337–339*).—A discussion of results previously noted (E. S. R., 17, p. 289).

Investigations on milk serum, F. Landolf (*Biochem. Ztschr., 10 (1908), No. 4–6 pp. 486–489*).—From the results obtained in investigations in continuation of earlier work (E. S. R., 19, p. 175) the author is convinced that lactose exists in milk not in three or four different modifications, the so-called α, β, γ, and δ forms, as given by other authors, but rather as carbohydrates united in various ways, which can be separated quite easily by fractional precipitation and subsequent fractional crystallization.

"Cieddu," F. Samarani (*Ann. R. Staz. Sper. Caseif. Lodi, 1907, pp. 95–98*).—Bacteriological examination of fresh "Cieddu" (Sardinian fermented milk) showed the presence of only two forms of micro-organisms, one a variety of *Bacterium lactis acidi* and the other a variety of *Bacillus casei* of Freudenreich.

Investigations on the tubercle bacillus content of milk and milk products sold in Leipzig, A. Eber (*Ztschr. Fleisch u. Milchhyg., 18 (1908), No. 10, pp. 309–319*).—In these investigations 19 out of 70 milk establishments supplied milk containing tubercle bacilli. Out of 210 samples of milk 22, or 15 per cent, contained these organisms, of 150 samples of butter 12 per cent, of 50 samples of cream 6 per cent, and of 50 samples of curds 4 per cent. No tubercle bacilli were found in 150 samples of margarin tested.

New cream bottle for Babcock test, J. W. Mitchell (*Ann. Rpts. Dairymen's Assocs. Ontario, 1907, p. 183*).—The author has devised a new style of bottle, which has a small neck graduated to read the percentage of fat for 9 gm. instead of 18 gm. of sample. This allows more room for readily mixing the contents.

Theoretical interpretation of the law of Crismer regarding the acidity of butter, G. Gesaro (*Bul. Soc. Chim. Belg., 22 (1908), No. 6, pp. 221–223*).—A mathematical demonstration of Crismer's statement that adding to the critical temperature of butter the number of cubic centimeters of twentieth-normal potassium hydroxid necessary to neutralize 2 cc. of the melted butter gives very approximately the critical temperature of the butter after neutralization.

Renovated butter, Loock (*Ztschr. Öffentl. Chem., 14 (1908), No. 10, pp. 195–198*).—Determinations of some of the usual constants are reported for spoiled butter before and after renovation. The renovating process consisted in removing the casein, salt, and water by melting, neutralizing the acidity by acid, filtering the fat, and freeing it from objectionable flavor by treatment with steam by a special apparatus. The fat thus obtained is put on the market in this condition, or after churning with milk and working, or mixed with good butter.

Report of the Finnish butter exhibits, 1906, G. A. Bredenberg and L. Sandberg (*Landtbr. Styr. Meddel., 1907, No. 57, pp. 39*).—From 222 creameries

taking part in the exhibits during the year, a total of 1,065 tubs were scored. These contained on the average 13.82 per cent water (ranging from 10.30 to 19.53 per cent), with an average refractive index of 51.2 (ranging from 49 to 54.2) that of the volatile acids ranging from 20.85 to 32.90. The former figure for volatile acids was obtained with butter from the herd milk of a well-known Finnish dairy farm, the output of which was doubtless unadulterated.

Report of the Swedish butter exhibits, 1907 (*Meddel. K. Landtbr. Styr. [Sweden], 1908, No. 4 (133), pp. 48*).—From 516 creameries participating in the exhibits during the year, a total of 2,074 tubs were scored. Chemical analyses showed that the average moisture content of the butter was 13.8 per cent (ranging from 10.3 to 18.5 per cent), and the refractive index 51.16 (ranging from 49 to 53.9). A paper giving directions for regulating the moisture content of butter, by L. F. Rosengren, is included in the report.

Report of the cheese experiment station at Lodi, C. Besana (*Ann. R. Staz. Sper. Casecif. Lodi, 1907, pp. 15–64*).—In addition to the account of the work of the station during the year and some reports of investigations, this publication includes an article on the Third International Dairy Congress at The Hague in September, 1907.

Chemical study of the ripening of soft cheese, R. Sanfelici (*Ann. R. Staz. Sper. Casecif. Lodi, 1907, pp. 65–94*).—The experimental data reported include determinations of the chemical composition and distribution of the nitrogenous substances and acidity in 5 samples of Quartirola and 4 samples of Crescenza cheese.

From the data reported the author concludes that in Crescenza cheese ripened at a low temperature (5 to 10° C.) the solubility of the casein is greater than in Quartirola cheese ripened at a somewhat higher temperature (15 to 20° C.). In these two types of soft cheeses the solubility of the casein and consequently the ripening is due to unorganized ferments or enzyms and very probably to the galactase of the milk and the pepsin of rennet. In Crescenza cheese the production of peptones is greater than in Quartirola cheese. The fat in these types of soft cheese does not undergo any appreciable alteration and does not participate in the ripening.

On paraffining of cheese and convenient appliances for same, L. F. Rosengren (*Nord. Mejeri Tidn., 23 (1908), No. 24, pp. 280–282, figs. 3*).—The paper deals with the advantages of paraffining cheese and describes apparatus for the purpose.

VETERINARY MEDICINE.

Annual report of the veterinary department, 1906–7, R. J. Stordy (*Colon. Rpts., Misc. [Gt. Brit.], No. 49, pp. 1–21, pls. 2, figs. 2*).—The veterinary staff of the East Africa Protectorate has been considerably enlarged, with the result that a great improvement has been observed in the work of controlling dangerous diseases. Statements are given of the present condition of African coast fever, pleuro-pneumonia, gangrenous ergotism, glanders, trypanosomiasis, intestinal parasites of horses, sheep scab, various parasitic worms in sheep, pleuro-pneumonia in goats, and diseases of dogs. *Buphaga erythrorhyncha*, locally known as the tick bird, is said to be of some benefit in feeding upon cattle ticks but has become a nuisance on account of its habit of attacking skin wounds of cattle.

Piroplasmosis, trypanosomiasis, and rinderpest, E. Meuleman (*Piroplasmoses, Trypanosomiases, et Peste Bovine. Brussels, 1907, pp. 176, pls. 4, map 1*).—An elaborate account is presented of the distribution, symptoms, etiology, pathological lesions, and means of preventing Texas fever, African coast fever,

nagana, surra, galziekte, trypanosomiasis of goats, and rinderpest. A bibliography relating to these diseases is appended to the volume.

Complication of rinderpest with piroplasmosis, J. KOWALEWSKY (*Jour. Méd. Vét. et Zootech., 59 (1908), Mar., pp. 146–150*).—The author describes the symptoms and pathological lesions produced in cattle simultaneously infected with rinderpest and piroplasmosis. A number of other instances are known in which two diseases may affect the same animal simultaneously.

Alterations in the blood of animals affected with experimental trypanosomiases, V. L. YAKIMOFF (*Arch. Sci. Biol. [St. Petersb.], 13 (1908), No. 3, pp. 243–276, pls. 2*).—The experiments reported by the author were made on various laboratory animals with cultures of the trypanosomes of nagana and mal de caderas.

With regard to the effect of experimental inoculation of trypanosomes upon the blood, three periods may be differentiated. In the first period there is an increase in the total number of leucocytes, particularly the polynuclear cells, and a decrease in the number of lymphocytes. In the second period the trypanosomes appear in the blood and simultaneously there is a decrease in the total number of leucocytes and an increase in the number of lymphocytes. The third period which in fatal cases occurs shortly before death is characterized by an increase in the number of polynuclear leucocytes and irregular variations in the relative proportions of the different forms of leucocytes.

A bibliography is appended.

The biology of the pathogenic organism of hemorrhagic septicemia, R. OSTERTAG (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 4 (1908), No. 1–2, pp. 1–4*).—The purpose of the study reported in this paper was to determine the importance of certain practical methods for controlling hemorrhagic septicemia. It appears that the organism of this disease is quite readily destroyed by desiccation, even in pure cultures being killed by desiccation for 7 days under the influence of diffuse sunlight. Experiments also indicated that under ordinary treatment the bacillus becomes completely nonvirulent on the skins of animals affected with the disease. On the other hand, the bacillus shows high resisting power toward decomposition, retaining its virulence for 100 days or more in decomposing blood and meat.

Lecithinophilous property of the tubercle bacillus and tuberculin, A. CALMETTE, L. MASSOL, and M. BRETON (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 13, pp. 676–679*).—In a series of experiments carried on by the authors it was found that serums which contain lecithin revealed its presence by their power of rendering cobra poison more active in disintegrating washed red blood corpuscles. In fact this method may be used for estimating quite closely the quantity of lecithin in sera, merely measuring the quantity of the serum which is capable of rendering active a certain weight of the cobra poison. It was found that the blood sera of tuberculous animals and man contain a considerable amount of lecithin while normal serum shows none of this substance.

The etiology of tuberculosis, M. P. RAVENEL (*Berlin. Klin. Wchnschr., 45 (1908), No. 16, pp. 788–793*).—A brief review is given of the literature on tuberculosis, particularly that relating to the point of origin of tuberculous infection. The feeding experiments and observations of the author along this line are summarized.

The conclusion is reached that the tubercle bacillus frequently gains entrance to the body through the alimentary canal and that such infection may take place without leaving any trace of lesion at the point of entrance, especially during the digestion of fats. After passing through the intestinal wall the tubercle bacilli are carried with the chyle through the lymph vessels and thoracic duct into the blood, subsequently reaching the lungs or other organs.

It is held that tuberculosis is frequently of alimentary origin in children as a result of drinking tuberculous milk or consuming other tuberculous products.

Cutaneous and conjunctival tuberculin reaction in cattle, REINECKE (*Berlin. Tierärzil. Wchnschr., 1908, No. 18, pp. 313–318, fig. 1*).—Of 25 cattle which were subjected to the cutaneous application of tuberculin only one showed a slight reaction. This animal had been inoculated with tubercle bacilli of human origin, but upon slaughter was found to be free from tuberculosis. Of the other 24, 6 reacted to subcutaneous reaction of tuberculin and 2 were found to be tuberculous upon post-mortem examination. Of 5 cattle which were tested with tuberculin upon the conjunctiva, 3 showed a slight reddening of the conjunctival mucosa and 2 of these proved to be tuberculous. The author concludes as a result of his investigations that neither a cutaneous nor conjunctival tuberculin test has a value equal to that of the subcutaneous method.

Report on tuberculosis of domesticated animals (*Bul. Serv. Pol. Sanit. Anim. Dom., 1906, No. 25 B, pp. 297–317*).—Extensive statistical data are given regarding the results of tuberculin tests on cattle for the purpose of showing the frequency and distribution of tuberculosis in Belgium. With regard to the control of tuberculosis, good results have been obtained in all instances from the use of the Bang method. The application of vaccination by von Behring's method showed that a high degree of resistance against tuberculosis may be produced with a duration of about 1 year.

The Dresden method of protective vaccination of cattle against tuberculosis, M. KLIMMER (*Berlin Tierärztl. Wchnschr., 1908, No. 14, pp. 241–243*).—It has been demonstrated that cattle may be immunized against tuberculosis by the use of tubercle bacilli from various sources. The immunity thus produced, however, does not last more than about a year. On this account it is necessary to repeat the inoculation from year to year in order to keep cattle protected against the disease. Such a process is out of the question in the case of dairy cows, for the reason that the milk might contain tubercle bacilli as a result of inoculation with attenuated bacilli. The author, therefore, tested the value of nonvirulent bacilli especially for use in the case of dairy cows. Satisfactory results were obtained and it is recommended that a hypodermic injection of 5 cc. of nonvirulent tubercle bacilli be made hypodermically, that the injection be repeated after 3 months and thereafter at yearly intervals.

Abortion, C. L. BEACH (*Connecticut Storrs Sta. Rpt. 1907, pp. 139–141*).—This disease was introduced into the college herd through the purchase of 6 pregnant animals. During the 3 years following 24 of the 79 calvings were premature. These premature births occurred from 145 to 262 days from time of conception, the average for the 24 cases being 211 days.

The sire was not the sole means of spreading the disease as the 24 conceptions that terminated in premature births were the result of matings with 15 different sires, 8 of which were owned by parties remote from the affected herd.

As it is frequently stated that an aborting cow is usually of little use in the dairy, milk and fat yields following a normal calving were compared with yields between normal calvings, in which the period of abortion was included. The milk yields were found to be 12 per cent less per year during the aborting period. The satisfactory yields are attributed in part to the complete removal of the afterbirth and the thorough disinfection of the animal after abortion, an account of which is given.

Only one of the 24 animals that experienced a premature birth failed to breed after abortion, and this animal at post-mortem examination showed the presence of an ovarian tumor which may originally have been caused by the treatment administered to induce conception.

Twenty-three of these cows produced a normal calf an average of 461 days subsequent to abortion, conception taking place practically 6 months after aborting. Experience indicates that it is useless to attempt to breed a cow for 4 or 5 months subsequent to aborting. To the yeast treatment is attributed in part the success in inducing conception following premature delivery.

The diagnosis of chronic forms of mammitis in cows by means of the method of Trommsdorff. H. MARTEL (*Hyg. Viande et Lait, 2 (1908), No. 4, pp. 161–165*).—A test of the Trommsdorff method for the identification of leucocytes indicated that this method can not be relied on exclusively in the diagnosis of mammitis without a veterinary examination of the suspected cows.

Aphthous pseudostomatitis of cows. LIÉNAUX (*Ann. Méd. Vét., 57 (1908), No. 4, pp. 185–193*).—Various investigators have studied the symptoms and pathology and attempted to determine the etiology of stomatitis in cattle with symptoms resembling foot-and-mouth disease. It is believed that the majority of cases of stomatitis of this form are due to a fungus or bacterial cause which produces an infection more readily after the mucous membrane has become injured or irritated by drugs or from other causes.

Texas fever. L. L. LEWIS (*Oklahoma Sta. Bul. 81, pp. 3–32, figs. 19*).—This bulletin includes a general discussion of Texas fever in which particular attention is paid to the life history, habits, and methods of eradication of the cattle tick. The author considers $750,000 to $1,000,000 to be at the present time a low estimate of the annual loss in Oklahoma due to this tick. In addition to *Margaropus annulatus*, the castor-bean tick, the net tick, the dog or wood tick, the lone-star tick, and the ear tick (*Ornithodoros megnini*) are described as parasites of cattle in Oklahoma.

While cattle may become immune to a certain degree of virulence of Texas fever infection, it is stated to be a common experience in many portions of Oklahoma for them to contract the disease when ticks from cattle shipped from farther south attach to them. In this way a great many cattle are lost every summer on account of the more virulent form of infection brought into the pastures and ranges. The methods of eradicating the cattle tick are described and plans are given for the construction of a dipping vat.

Poisonous symptoms after feeding peanut meal (*Illus. Landw. Ztg., 28 (1908), No. 29, pp. 259, 260*).—A few cases of poisoning have been noted from the effects of feeding peanut meals which have been adulterated or have become contaminated with molds or other injurious materials. The symptoms in one case included diarrhea, loss of appetite, diminution of milk yield, and fever. The peanut meal which caused these effects in cows was found to contain a small quantity of castor-oil beans.

The bacillus of Preisz-Nocard in ovine pathology. H. CARRÉ and L. BIGOTEAU (*Rev. Gén. Méd. Vét., 11 (1908), Nos. 127, pp. 369–380; 128, pp. 433–449*).—The bacillus of Preisz-Nocard has been studied by a number of investigators with particular reference to the details in the pathological lesions which it produces and the criteria for arriving at a differential diagnosis. As a rule, an infection with this organism may be distinguished from anthrax by the fact that in the former case the organism is not found in the blood.

Gangrenous mammitis in sheep. W. PFEILER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 4 (1908), No. 1–2, pp. 132–136*).—A micrococcus was isolated from the udder of a sheep affected with gangrenous inflammation. This organism was grown on a number of nutrient media and inoculation experiments were tried to determine its pathogenic properties and the modes of infection. The organism readily produced infection when injected directly into the udder or through the milk canal. The mere presence of the bacillus upon the exterior of the udder appears seldom to produce an infection. There is, therefore, little

danger of transmitting the disease in milking sheep where these animals are kept for milk. The disease can not be cured by external treatment, as it is necessary to remove the affected part of the udder.

Certain eye diseases among horses. V. Ohlholm (*Maanedskr. Dyrlæger, 19 (1908), No. 12, pp. 449–466*).—Notes are given on the pathology, distribution, occurrence, and treatment of periodic ophthalmia, simple iritis, and *Filaria papillosa* in the eye.

Immunization against glanders. A. Marxer (*Berlin. Tierärztl. Wchnschr., 1908, No. 13, pp. 229–231*).—Experiments were made in attenuating cultures of glanders bacilli in solutions of glycerin and urea. It was found that the attenuation was directly proportional to the temperature and inversely proportional to the density of the emulsion. No satisfactory results were obtained from the use of attenuated bacilli. By killing the glanders bacilli in a 10 per cent solution of urea a more satisfactory preparation was obtained. For this purpose 0.1 gm. of the bacilli was placed in 4 cc. of the urea solution for 17 hours. A dry extract was obtained from this material and used for immunizing purposes. Similar results were obtained with the use of glycerin in the place of urea.

Experiments were first carried on with laboratory animals and later with horses. It was found possible to produce an immunity in horses for a period of at least 1 year by a single injection with a preparation of dead glanders bacilli.

Loco weed poisoning in horses. A. T. Peters and L. B. Sturdevant (*Nebraska Sta. Rpt. 1907, pp. 74–107, figs. 4*).—As a result of experiments conducted, the authors conclude that "hunger will lead many horses to eat loco weed when the grass is short, especially in the early spring or in the late fall, or even in wet seasons when the grass is not short, probably because the weed is then more succulent. A small grain ration when the grass is short will usually be sufficient to keep the animals from forming the loco-eating habit. After a horse has eaten loco for a time, this habit becomes permanent in most cases."

The loco-eating habit was permanently formed in 1 horse after 118 lbs. of picked *Astragalus mollissimus* had been eaten and probably long before this. "This animal lived 62 days after the picked loco was first fed and consumed a total of 322 lbs. of this besides that eaten in pasture and on the prairie. Six lbs. of picked *Aragallus lamberti* fed in 1 day to a second horse was not sufficient to induce the loco habit, but after 21½ lbs. of picked *A. lamberti* and 10½ lbs. of *A. mollissimus* had been eaten the habit was permanently induced. This animal died 25 days after the first of this weed had been fed. The loco-eating habit was permanently induced in another horse by 5 lbs of *A. mollissimus* fed on each of 2 successive days. The total amount of picked loco eaten by this animal was 221½ lbs., and death occurred 50 days after the first of this was fed. Post-mortem examinations indicated that the greatest change was induced in the nervous system, which showed much congestion throughout.

A protozoan observed in cases of epizootic lymphangitis in mules. E. Ducloux (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 13, pp. 593–595*).—The author had opportunity to examine the pathological lesions in mules affected with epizootic lymphangitis, particularly in the fore legs. The purulent material obtained from swellings contained leucocytes which were infected with a protozoan parasite. In some cases a single polynuclear leucocyte contained as many as 32 of the parasitic protozoa. These parasites were observed in various stages of development undergoing division and changes of form. The author proposes the name *Leucocytozoon piroplasmoides* for the parasite.

Inspection of pork in cases of diamond-skin disease for virulent bacilli of swine erysipelas. A. Schuh (*Deut. Tierärztl. Wchnschr., 16 (1908), Nos. 16, pp. 229–236; 17, pp. 245–248*).—Samples were taken from the musculature and various organs of 23 hogs affected with swine erysipelas. Microscopic examination was made of this material and inoculation tests were carried on to determine the presence and virulence of the bacilli of swine erysipelas.

It was found that in hogs in which a fresh infection of the disease prevailed and in which numerous small diamond-shaped areas had appeared but had not yet become reddened the bacilli of swine erysipelas were present in the organs as shown by the inoculation of minute particles of tissue in white mice. In more advanced cases showing numerous red patches on the skin the bacilli were demonstrated both in cultures and from the inoculation of mice. Similar material taken from cases of the disease in later stages showed that the bacilli are sometimes present and sometimes absent from the organs. By taking a number of samples of tissue, however, it was found that in every case of swine erysipelas to be recognized clinically, virulent bacilli were present, as demonstrated by inoculation of white or gray mice. The bacilli could not be demonstrated in the organs of hogs on which the spots did not appear during life, but only after scalding.

On a spirochete occurring in the blood of chickens in northern India. R. E. Montgomery (*Jour. Trop. Vet. Sci., 3 (1908), No. 1, pp. 1–2, pls. 2, fig. 1*).—The author has observed the unusual prevalence of *Argas persicus* in various parts of India. In an outbreak of the disease among chickens spirochetes were found in the blood in large numbers both before and after death. By experimental tests it was found that the spirochetes could be transferred from one animal to another through the agency of *A. persicus*. The period of incubation varies from 1 to 4 days. The morphology of *Spirochæta gallinarum* is described in detail. In the author's opinion the possibility is not excluded that the human spirochete of India may be inoculable into chickens or vice versa.

Streptococcic diseases of fowls. L. Greve (*Deut. Tierärztl. Wchnschr., 16 (1908), No. 15, pp. 213–215*).—Occasion was had to examine fowls affected with a kind of sleeping sickness due to streptococci. The micro-organisms were found in large numbers in the blood. By means of inoculation experiments it was shown that the disease may be transmitted to pigeons and mice. Apparently the disease is not rapidly transmitted by mere contact with affected fowls.

Infectious leukemia in ducks. C. J. Pound (*Queensland Agr. Jour., 20 (1908), No. 3, pp. 136–138*).—An outbreak of infectious leukemia occurred in ducks causing a mortality of 60 per cent or more. The disease runs a course of 7 to 14 days and the incubation period ranges from 3 to 5 days. The micro-organism found in cases of this disease is described and notes are given on its behavior in various culture media. No remedial treatment seems to be of avail and the author, therefore, recommends the isolation of diseased birds and thorough disinfection.

A plague affecting canary birds. W. Zwick (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 4 (1908), No. 1–2, pp. 33–49, pl. 1, figs. 5*).—According to the available literature on this subject there appear to be five distinct infectious diseases which affect canary birds. The author had occasion to study a serious outbreak of an infectious disease among these birds. The feathers appeared ruffled, the appetite was soon lost, the head was held for the most part under the wing or in the feathers, and in most cases death took place within from 24 to 36 hours. An organism was isolated from affected birds and its behavior was studied on various culture media. The bacillus in question appears not to form a filterable toxin. Pigeons and chickens are not susceptible to the

bacillus but infection may be produced in guinea pigs, sparrows, and other experimental animals.

Local eosinophilia in cases of infections with animal parasites, A. F. Fölger (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 4 (1908), No. 1–2, pp. 102–131, pls. 2*).—Much attention has been given to the variations in the number and relative proportions of leucocytes during the prevalence of infections and parasitic diseases. An increase in the number of eosinophilous leucocytes is generally recognized as an important indication of pathological conditions.

The observations reported by the author were largely made on tissues from animals infested with Sarcosporidia, fluke worms, and cysticerci. Sarcosporidia in the musculature of various animals as a rule caused no general disturbance, the pathological changes being purely local. No alteration in the proportion of eosinophilous cells was observed in such cases. In the liver of cattle and sheep affected with fluke worms, the eosinophilous cells were present in greatly increased numbers. An increase in the number of these cells was also observed in the liver of hogs infested with *Cysticercus tenuicollis*.

Notes on some parasites in Burma, G. H. Evans and T. Rennie (*Jour. Trop. Vet. Sci., 3 (1908), No. 1, pp. 13–27, pls. 10*).—Elaborate anatomical and descriptive notes are given on apparently new species of Gastrodiscus found in cattle and horses, the pancreatic fluke in cattle, and an unknown species of Gastrothylax.

RURAL ENGINEERING.

Installation of an experimental drainage system, W. Robertson and J. T. Stewart (*Minnesota Sta. Bul. 110, pp. 3–99, figs. 62, map 1*).—This bulletin describes the installation of a complete system of open and tile drains on the Northwest Experiment Farm at Crookston, by the University of Minnesota, under the supervision of a drainage engineer connected with this Office, who made the surveys and plans. The investigation made for planning the system included a topographical survey, study of the rainfall conditions, soil examination and analysis, and soil water analysis. The problem was not only to remove the rainfall from the farm but to prevent overflow from higher lands. Underdrainage in the soil found here was considered an experiment and on this account the depth and distance apart of the drains were varied, as well as the kind of tile and the method of laying it.

The construction of open ditches by slip scrapers is illustrated and discussed with the figures of cost. Tile ditches were constructed by hand and by machine, and the cost and methods of each are shown and compared. The operation and construction of the traction ditcher which was used, and the difficulties encountered with it, are described in detail. The soil, a fine clay, was quite wet, and operating delays were frequent, due to slipping wheels, cups clogging, wet earth on the rollers, and grass roots collecting on the knives, as well as breakage. The soil finally had to be broken with a plow before the machine was used, and the work frequently had to be supplemented by hand digging. The machine used was a second-hand one, having been used for demonstration purposes at the factory, and it is believed that many of the difficulties encountered would be overcome by the modern improvements in the more recent machines. The best condition for machine work is deemed to be in dry ground which is in cultivation.

Stress is laid upon the methods of protecting the outlets in tile drains. Outlets were constructed of wood box, sewer pipe, tile inclosed in cement, concrete abutment, and metal pipe, and the total cost of each of these is shown, as well as the method of construction. A tile record contains in tabular form complete

details of the tile system, including the cost of each necessary item for different sizes and depths of tile. The cost of the tile and of hauling and distributing are also noted.

A brief account of house and yard drainage installed is given. There is also a short account of the manufacture of cement tile, both on the farm and in the factory. The experience with that made on the farm indicated that it is not economical to manufacture small-sized pipe.

A portion of the bulletin is devoted to reports on excavating machinery used in the Red River Valley. Two land machines, a ditcher and a walking dredge, are described, the former being reported to be specially suited to land which is stable enough to support its track and which is comparatively free from timber or rock. An elevating grader, used on the farm, is also described.

Irrigation and drainage, C. F. Brown (*Deseret Farmer, 5 (1908), No. 12, pp. 5, 12, 13, fig. 1*).—This is a popular article dealing with the drainage of seeped lands in irrigated regions, and briefly outlines the general principles to be observed in reclaiming this class of land. It describes the procedure necessary to prepare suitable plans for drainage and the practical considerations necessary to maintain the drains in proper order. It is remarked that it is not sufficient merely to intercept the seeped water but that an outlet must also be made on the lower land. The article includes a description of the investigation and plans made for reclaiming a tract of 50 acres of seeped land in the Bear River Valley, Utah.

Geometrical measuring plate (*Illus. Landw. Ztg., 28 (1908), No. 81, p. 704, figs. 5*).—This article describes a simple measuring device suitable for farm surveying and for obtaining differences in elevation. It consists of a plate graduated in degrees like a protractor, and two standards by which a line of sight is established. It is used for surveying by triangulating from a measured base line, and in place of a level by reading horizontal angles. To do this the plate can be set in a vertical plane and a vertical line constructed with the aid of a plumb-bob.

Tests of gasoline-operated farm motors (*Canad. Thresherman and Farmer, 11 (1908), No. 8, pp. 5–6, 70, figs. 20; Nor'-West Farmer, 27 (1908), No. 14, pp. 677, 678, figs. 5*).—There are described here the various machines entered in the agricultural motor contest held in July at Winnipeg, Canada, the first ever held in America, with the conditions prescribed for the competitors and the methods used in judging the winners.

Plowing by the direct system with motor power, V. Thallmayer (*Landw. Masch. u. Geräte, 8 (1908), No. 22, pp. 1, 2, figs. 3*).—A brief discussion of the general principles of motor cultivation, with the following results of tests made in Winnipeg, Canada, at the contest noted above:

Tests of gasoline-operated motors.

Rating of motor.	Weight.	Number of plowshares.	Width of furrow.	Velocity per second.	Results per acre.	
					Time required.	Consumption of gasoline.
H. P.	*Lbs.*		*Ft.*	*Ft.*	*h. m.*	*Gals.*
15	9,880	3	3.51	3.28	1 6	3.91
40	12,900	5	5.81	2.96	0 42	4.25
30	13,500	6	6.98	2.79	0 37	4.41

Beet diggers, G. FISCHER (*Masch. Ztg., 6 (1908), No. 20, pp. 229–232, figs. 6*).—This article deals with the difficulties met with in the construction of satisfactory beet diggers, resulting in their prohibitive cost, and the progress made recently in their manufacture. Several types are illustrated and their mode of operating described, with remarks on their relative efficiency.

Farm implements in Germany, R. R. DENNIS (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3253, pp. 1–4*).—This is an account of the domestic and foreign agricultural machinery on exhibition at the German Agricultural Society show held at Cannstatt-Stuttgart in 1908. The reasons why American, English, and other foreign-made agricultural machinery is so little used in Germany are also discussed, with suggestions to American manufacturers regarding the increase of trade in agricultural implements and machinery.

Strength test of harness leather, G. R. CHATBURN (*Nebraska Sta. Rpt. 1907, p. 73, fig. 1*).—In two breaking tests, made on new 1¾-in. farm harness tugs with attached hame tugs, the leather failed by tearing through the buckle hole. The results gave values of 1,000 and 1,050 lbs., respectively, for the beginning of failure, and 1,400 and 1,570 lbs. for the breaking load, from which it is calculated that on earth roads in fairly good condition the tug is capable of hauling practically 6 tons.

Lighting country homes by private electric plants, T. H. AMRINE (*Illinois Sta. Circ. 121, pp. 35, figs. 11; Univ. Ill. Engin. Expt. Sta. Bul. 25, pp. 35*).—This bulletin discusses the features essential to the success of installing and maintaining at a reasonable cost a satisfactory electric light plant for country homes, and presents the design of such a plant in sufficient detail so that it is believed it will enable anyone to decide on the size and equipment necessary to install a similar plant.

Such plants are now considered practicable by the introduction of the tungsten filament lamp, which, because of its high efficiency, reduces the necessary size of storage battery. Proper attention to the selection of fixtures and planning of the lighting arrangement contributes largely to the economy of the system. Shades should be selected with reference to their ability to diffuse the light or throw it in a given direction as may be required. The placing of fixtures is also important and should be governed by their usefulness rather than appearance in the room. These points are illustrated by an example of a lighting scheme for a medium-sized private residence. A glossary of technical terms is appended.

RURAL ECONOMICS.

The State and the farmer, L. H. BAILEY (*New York and London, 1908, pp. XII+177*).—The author discusses what it is wise and legitimate for governments to do in aid of the farmer and how, in general, it may be accomplished. The present-day needs of rural communities are believed to be greater technical knowledge of agriculture, governmental protection, the development of the cooperative spirit, the establishment of common centers of interest in rural districts, and development of individual initiative. For the improvement of these needs State and Federal governments should cooperate not for the sake of the individual farmer but because of its bearing on National welfare.

Agricultural legislation, H. L. RUDLOFF (*Fühling's Landw. Ztg., 57 (1908), Nos. 14, pp. 497–502; 15, pp. 535–542*).—A summary of the titles of different laws relating to agriculture are presented and discussed in this article. The legislation considered begins with the decree of September 28, 1791, in France and is brought down to 1905. The agricultural legislation of Belgium, Argentina, Hungary, and the two cantons of Aargau and Neuchâtel in Switzerland are likewise summarized and discussed.

Farm leasing system in New York State (*Breeder's Gaz., 54 (1908), No. 7, pp. 255, 256*).—This is a description and discussion of the system of leasing and farm management practiced on the 30,000-acre Wadsworth estate in the Genesee Valley. One of the most unusual features of the lease is that the tenant pays all taxes. This gives the tenant a personal interest in the farm and places upon him the duties of citizenship. The tenant is thus compelled to participate in the activities which the State, county, and district require of citizens.

The system of farm management practiced, which is under the personal direction of the owner, aims to maintain as well as to improve the fertility of the soil. The system has been in operation for a century. It is said to secure permanence of tenantry, to keep the land in good condition, and to work for the economic advantage of both tenant and landlord.

The subdivision of farms in France, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 16 (1908), No. 27, pp. 9, 10*).—This article calls attention to the system of farm holdings which prevails throughout France. It appears that the farms consist of numerous small, noncontiguous parcels of land. As an extreme illustration of French farm-holding conditions, a single proprietorship in the Department of Haute-Saône of 30 hectares (about 74 acres) was composed of 130 separated plats. It is estimated that the farm lands of France consist of more than 125,000,000 plats, "the average of each farm holding being 10 plats. In some eastern provinces a farm sometimes consists of 100 plats."

The author calls attention to the enormous economic waste arising from such conditions, the inability of farmers to use machinery to advantage, the loss of time in passing from one plat to the other, etc., and believes the present farm system is a problem requiring an immediate practical remedy.

The exchange and reassignment of land, L. GRANDEAU (*Jour. Agr. Prat., n. ser., 16 (1908), No. 28, pp. 37, 38*).—The author calls attention to the economic waste arising from the present system of working the 125,000,000 small strips of land into which the farms of France are subdivided, and advocates the reassignment of farm lands directly by the government or the voluntary exchange of separate small parcels by neighboring farmers under government supervision. The latter is regarded as the better plan. The economic advantages of repartition are illustrated from results accomplished in Sweden and Germany. The chief articles of the Saxon law bearing on this subject are included.

The fluctuations in value of agricultural land in France since 1851, R. SAULNIER (*Écon. Franç., 36 (1908), II, No. 32, pp. 202–205*).—The author gives statistics of land values and discusses the causes of the fluctuations in value which the returns show.

From 1851 to 1879 there was with few exceptions a general rise in agricultural land values in all departments of France, averaging for the whole of France 43.8 per cent, and reaching as high as 141.7 per cent increase in value in the Department of Allier. From 1880 to 1905 there was a general decrease in values, reaching 67 per cent in the Department of Aude and averaging 30.5 per cent decrease for the country at large. Since 1905 the decrease in value has continued in 35 departments, while in the rest of France land values have remained stationary or have only slightly increased. The average agricultural land values were as follows: In 1851, 1,275 francs per hectare; in 1879, the highest period, 1,830 francs; and in 1905, the lowest period, 1,264 francs per hectare. Suggestions for the formation of more stable conditions are presented.

The fluctuations in value of agricultural land in France, D. ZOLLA (*Jour. Débats Polit. et Lit., 120 (1908), No. 261, p. 2; Écon. Franç., 36 (1908), II, No. 39, p. 457*).—From statistics derived from the rent-rolls of eleemosynary institutions in several departments of France, the author shows that from 1876

to 1906, land decreased in value from 20 to 43 per cent according to location. The decrease in general is about 31 per cent, which corresponds closely with the figure reached by Saulnier (see above). The author believes, however, that the price of agricultural products is sure to rise and that this tendency will raise the value of agricultural lands again in the near future.

The farm labor problem (*Wallaces' Farmer, 33 (1908), No. 37, p. 1084*).—In this article attention is called to the scarcity of practical farm help and the impossibility of farmers employing men from cities to advantage in modern farm work. The only remedy open to farmers is believed to be in the use of more machinery and less labor.

The white immigrant as a plantation laborer, W. J. Behan (*La. Planter, 41 (1908), No. 8, pp. 125, 126, figs. 4*).—The author relates the experience of southern planters in dealing with Bulgarian immigrants. Instead of paying them by the day and allowing them to board themselves, in which case they would invariably leave the farms after the grinding season, the plan of paying them $15 per month, afterwards increased to $20, with board and lodging was adopted. This method proved eminently successful in keeping these laborers on the land, and in the author's opinion offers a practical solution of the labor problem on sugar plantations in the South.

Rural mutual association, T. Sarazin (*Semaine Agr. [Paris], 27 (1908), No. 1418, pp. 236, 237*).—The author points out the educational and economic benefits to farmers of the principle of mutual help, and sets forth the objects and methods of the different mutual associations in France and other European countries.

The agricultural cooperative congress at Piacenza, E. Ottavi (*Coltivatore, 54 (1908), No. 40, pp. 422–426*).—A brief account is presented of this congress of national and international agricultural cooperative societies, held at Piacenza on September 23–26, 1908. At that date the societies for the purchase of supplies numbered 1,414 and the rural banks 1,650. The "affittanze collettive," or societies of agricultural laborers, numbered 150, a gain of 42 during the year (E. S. R., 19, p. 587).

Agricultural mutual credit banks in 1907 (*Semaine Agr. [Paris], 27 (1908), No. 1420, p. 251*).—The returns for 1907 show that the district banks numbered 88, the local banks affiliated with the district banks 2,168, with 96,192 adherents, and new loans during the year of 45,376,309 francs. These figures show substantial gains over 1906 (E. S. R., 19, p. 692).

Agricultural credit banks (*Economist, 67 (1908), No. 3390, pp. 306, 307*).—This is a discussion of the development and methods of operation of agricultural credit banks in Ireland, Germany, and France, and of their adaptability to England in connection with the working of the Small Holdings Act (E. S. R., 19, p. 1087).

Agricultural credit societies (*Jour. Bd. Agr. [London], 15 (1908), No. 6, pp. 407–414*).—An article similar in scope to the above.

The new development in agricultural cooperation, H. Plunkett (*Irish Homestead, 15 (1908), Nos. 32, pp. 630–632; 33, pp. 650–652; 34, pp. 670, 671*).—This article sets forth the objects and aims of the centralized organization due to the combination of the Irish, English, and Scotch agricultural organization societies. Two boards were constituted, one for extending organization among farmers and the other for extending cooperative trade in farm products. This new machinery will also be used as opportunity offers for advancing and protecting the interests of the agricultural classes in relation to government. The practicability of these lines of activity is fully discussed.

Credit bank for the encouragement of irrigation works and agriculture (*Bol. Soc. Agr. Mexicana, 32 (1908), No. 34, pp. 661–665; Mod. Mex., 28 (1908),*

No. 35, pp. 6, 7).—The articles of incorporation for the establishment of a new bank under authority of a government concession dated September 3, 1908, are reported.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 11, pp. 81–88*).—The usual statistics on the condition, value, and prices of principal crops in the United States, together with the condition and yields of crops in foreign countries, are tabulated and discussed.

AGRICULTURAL EDUCATION.

Preliminary report of the Committee on Industrial Education in Schools for Rural Communities (*Nat. Ed. Assoc. Advance Print, 1908, pp. 64*).—This is the third report of the committee. It includes a brief historical statement concerning the two previous reports, and detailed reports by D. J. Crosby and O. J. Kern on instruction in agriculture in 4 types of schools, viz: (1) High schools in small villages, as represented by the borough and township high school at Waterford, Pa.; (2) rural high schools with a strong agricultural trend to their curricula, as represented by the Cecil County Agricultural School, Calvert, Md.; (3) consolidated schools, as represented by the John Swaney Consolidated School, near McNabb, Ill.; (4) technical agricultural high schools, as represented by the district agricultural schools in Georgia. The report has been previously noted (E. S. R., 19, p. 1197).

Farmers' Institute Report, J. H. Miller (*Industrialist, Farmers' Inst. Ser., 1 (1908), No. D, pp. 80, figs. 20*).—This report covers the biennial period ended June 30, 1908, and includes not only a report covering the work of this period but also suggestions for improving the farmers' institute work, for young people's contests, demonstration work, cooperation with other organizations, agriculture in the rural schools, improving the rural schools and home surroundings, and women's work in farmers' institutes. There is also included an announcement of winter meetings at the Kansas State Agricultural College, a reprint of the Kansas farmers' institute law, a suggestive constitution and by-laws for farmers' institute organizations, and tabular matter concerning the different phases of work carried on by the superintendent of institutes.

Instruction in practical agriculture at the University farm, Davis, California (*California Sta. Circ. 39, pp. 3–18, figs. 19*).—This circular contains the announcements given in Circular 37 previously noted (E. S. R., 20, p. 192), but is illustrated and includes an announcement of the regular two-year course at the school of agriculture, Davis, to be opened in January, 1909.

Manual of agriculture for the common schools of Illinois, D. O. Barto (*New York and Chicago, 1908, pp. 51*).—The author intends this manual for the use of teachers giving instruction in agriculture to pupils of the seventh and eighth grades. It consists mainly of exercises relating to soils and growing crops and includes indoor and outdoor work. A list of books and bulletins which will be useful to teachers and pupils is appended.

A plan for presentation of the science of agriculture for the use of teachers, H. A. Morgan and J. Main (*[Knoxville, Tenn.], 1908, pp. 16*).—A unique diagram has been devised by the authors to illustrate nature's cycle and the relations of the mineral, plant, and animal kingdoms to each other and to man. This diagram and the cycle which it illustrates are made the basis for the order of teaching the subject of agriculture and for illustrating the relation of different branches of agriculture to each other.

Exercises in elementary quantitative analysis for students of agriculture, A. T. Lincoln and J. H. Walton, Jr. (*New York, 1907, pp. XV+218, figs. 32*).—This book contains introductory exercises in gravimetric analysis, acidimetry

and alkalimetry, permanganate and dichromate titrations, iodimetry, stoichiometry, and a section on agricultural analysis covering the examination of milk, butter, cereals and feeding materials, fertilizers and soils. It is designed primarily as an elementary quantitative guide for the use of agricultural students, but may also be used for work in general elementary quantitative analysis.

Dry-land farming: Drought-resistant crops and a system of soil culture, A. M. Ten Eyck (*Industrialist, Farmers' Inst. Scr., 1 (1908), No. A, pp. 25*).—In this article the author discusses (1) drought-resistant crops, dealing with soil and culture, use of water, amount of water required by crops, moisture in soil after cropping, principal dry-land farming crops, dry-land crops in eastern Colorado, crops for western Kansas, breeding drought-resistant crops, and experiment station problems, and (2) a system of soil culture, including systematic tillage, tillage and fertility, implements and methods, deep plowing, soil mulch, disking after harvest, and harrowing wheat.

Demonstration problems for Farmers' Institute members, and others (*Industrialist, Farmers' Inst. Scr., 1 (1908), No. C, pp. 64*).—This pamphlet contains suggestions for cooperative crop demonstrations by A. M. Ten Eyck, cooperative feeding demonstrations by R. J. Kinzer, demonstrations in the orchard and garden by Albert Dickens, demonstrations with poultry by W. A. Lamb, and demonstrations in dairying by J. C. Kendall.

The poultry industry, D. M. Wilson and W. A. Lamb (*Industrialist, Farmers' Inst. Scr., 1 (1908), No. 3, pp. 151, figs. 27*).—This article written from a market standpoint is intended to help beginners and to bring the poultry industry into more prominence. It includes a discussion of (1) the care and management of ducks, geese, and turkeys, and (2) chickens—breeds and history of American and Asiatic varieties, choosing a breed, care and management, feeding for egg production, preparing eggs for market, determining the layers, poultry houses, incubators and brooders, feeding incubator chicks, fattening chickens for market, profit in poultry, the poultry house as a schoolroom, and the study of poultry by town and village youth. A list of "don'ts," a chicken talk, and an official score card are appended.

Nature-study, F. L. Holtz (*New York, 1908, pp. XIV+546, pl. 1 figs. 171*).—This manual "is designed as an aid and guide to the practical teacher, and as a text-book in methods of nature study for normal and training schools." It consists of 3 parts.

Part I is devoted to a discussion of underlying principles and methods—the motive in nature study, its educational, esthetic and ethical values, studying nature in the grades—how and what, illustrative material, and correlation. "Part II contains appropriate subject-matter of a biological nature, and practical hints and suggestions on the collection and care of material, and the presentation of lessons." Part III consists of a course in nature study for the 8 grades, the requirements of both city and rural schools being considered.

A list of primary information books and nature stories and a general reference list are appended.

Our useful birds, J. S. Hine (*Agr. Col. Ext. Bul. [Ohio State Univ.], 3 (1908), No. 10, pp. 16, figs. 12, dgms. 2*).—This is a study of the economic habits of birds, including a diagram showing the relations of birds and insects on an Ohio farm, and comparative statements of the benefits and injuries of 20 different birds.

The story of corn, Mary C. Breen (*Hampton Leaflets, n. scr., 4 (1908), No. 3, pp. 24, figs 10*).—This study of corn, prepared for the use of teachers, includes 10 experiments in seed germination, field observations, and the use of corn products.

MISCELLANEOUS.

Nineteenth Annual Report of Connecticut Storrs Station, 1907 (*Connecticut Storrs Sta. Rpt. 1907, pp. XXV+179*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1907, reports of the director and heads of departments, reprints of Bulletins 43-48 of the station, tests of 6 cows for advanced registry, and special articles noted elsewhere in this issue.

Twenty-first Annual Report of Maryland Station, 1908 (*Maryland Sta. Rpt. 1908, pp. XXXI+298*).—This contains the organization list, a report by the director on the work and expenditures of the station, a financial statement for the fiscal year ended June 30, 1908, and reprints of Bulletins 119–128 previously noted.

Twenty-first Annual Report of Nebraska Station, 1907 (*Nebraska Sta. Rpt. 1907, pp. XXXIII+107*).—This contains the organization list, a review of the work of the station during the year, a financial statement for the fiscal year ended June 30, 1907, and special articles noted elsewhere in this issue.

Twenty-sixth Annual Report of Ohio Station, 1907 (*Ohio Sta. Bul. 185, pp. XXV*).—This contains an announcement concerning the work of the station, the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1907, and a report of the director summarizing the work of the station during the year.

Summary of experiment station work (*Oklahoma Sta. Circ. Inform. 12, pp. 6*).—A brief statement of the lines of work undertaken by the station since its organization in 1891.

How the experiment station can be of service to the farmers of Virginia (*Virginia Sta. Circ. 2, pp. 20, figs. 9*).—A popular summary of the purpose, equipment, lines of work, and publications of the Virginia Station, together with a brief note on the work of the Virginia Truck Station.

Press bulletins (*Ohio Sta. Bul. 185, pp. 311–318*).—Reprints of press bulletins on the following subjects: Spraying potatoes for late blight advisable in 1906; forestry investigations by the Ohio Agricultural Experiment Station; fertilizers for wheat in southeastern Ohio; late blight or rot of potatoes has appeared; fertilizing wheat in the Miami Valley; fertilizing wheat on a run-down farm; forty bushels of wheat to the acre; Hessian fly; what is the condition of your seed corn; and a word of caution regarding alfalfa.

Accessions to the Department Library, January–September, 1908 (*U. S. Dept. Agr., Library Buls. 67, pp. 5–72; 68, pp. 5–52; 69 pp. 5–51.*

NOTES.

Alabama College and Station.—F. E. Lloyd, formerly connected with Teachers' College, Columbia University, has been appointed professor of botany in the college and botanist in the station.

Florida University.—A constitutional amendment proposed by the legislature, authorizing a one mill tax for the benefit of the university, was defeated by a narrow margin in the November election. The correspondence course for teachers in agriculture, carried on by the university, has met with most gratifying success, over 350 teachers of the State registering for this work.

Georgia College.—The agricultural building has been completed at a cost of $100,000. It is about 260 by 80 ft., of cream-colored pressed brick with terra-cotta trimmings, Bedford limestone foundation, and a roof of red tiling. The registration in the 4-year course is now about 60. The cotton school is to be repeated this winter, and a roads school and a farmers' conference at the college are contemplated.

Hawaiian Sugar Planters' Station.—A special feature of the annual meeting of the Hawaiian Sugar Planters' Association, which took place in Honolulu, November 9–12, was the session held at the station at which the directors of the respective divisions gave demonstrations on the work now in progress, to the great interest of the members. At another session short lectures were given by members of the station staff on special lines of work. S. M. Damon was elected president of the association, and subsequently appointed F. M. Swanzy as chairman of the experiment station committee, with G. H. Robertson and T. H. Petrie as the subcommittee for the division of agriculture and chemistry, W. M. Giffard and F. Klamp for that of entomology, and George Davies and J. W. Waldron for that of pathology and physiology.

Idaho Station.—H. P. Fishburn, assistant chemist in the Pennsylvania College and Station, has accepted the position of assistant chemist, entering upon his duties January 1.

Louisiana Stations.—J. B. Garrett, assistant entomologist at the State Station, has been transferred to the Calhoun Station as assistant director in charge, vice J. G. Lee, resigned on account of ill health. W. D. Reid, of the Mississippi College, has been appointed assistant chemist in the State Station, vice W. G. Taggart, who was transferred to the Sugar Station January 1 for research work. A. B. Joffrion, P. H. Doherty, and B. F. Hochenedel are spending the grinding season in Cuba. E. M. Percy has also been added to the station staff at the State Station and is cooperating with the professor of mechanical engineering in the university in tests of the efficiency of the sugar-house machinery in use in the State.

Maryland College and Station.—P. M. Novik, for the last 2 years lecturer in horticulture in the college and assistant horticulturist in the State control work, was killed in a railway accident near Hyattsville, Md., December 9. He was a native of Norway, coming to this country about 8 years ago, and was a graduate of Cornell University.

Minnesota University and Station.—John W. Olsen, State superintendent of public instruction, has been appointed dean of the college and school of agricul-

ture and director of the station, vice E. W. Randall, resigned to accept a commercial position.

Mississippi College and Station.—R. W. Harned, assistant in biology in the college, has been elected entomologist in the station.

Missouri University and Station.—The corner stone of the $100,000 agricultural building was laid October 26 with appropriate ceremonies, the speakers including former Secretary of Agriculture Norman J. Coleman, Dr. B. T. Galloway, of the Bureau of Plant Industry of this Department, President A. Ross Hill and former President R. H. Jesse of the university, B. H. Bonfoeyn, of the board of curators, and Dean H. J. Waters of the college of agriculture. A special feature was the inclusion in the material deposited beneath the corner stone of an ear of corn chosen in a widely advertised competition open to farmers in the State. The building is not expected to be ready for occupancy before the beginning of the next academic year, at which time it is believed the accommodations provided will be taxed to the utmost. The present enrollment in the college of agriculture is 15 per cent in excess of that of any previous year.

A seed-testing laboratory in cooperation with this Department has been established in charge of the station agronomist.

Nebraska University and Station.—Dr. E. Benjamin Andrews retired as chancellor December 31, 1908, on account of failing health, Dr. S. Avery assuming the duties of acting chancellor. E. M. Little, assistant in dairy husbandry, has accepted a position in charge of a stock-breeding farm.

New Mexico Station.—Edward Heringa, assistant in soils and irrigation, has resigned to accept a position with the State Industrial School at Whittier, Cal.

Cornell University.—A farm special train was sent out over the Erie Railroad November 23–25, the staff including a large number of members of the faculty of the college of agriculture, the deans of the State schools of agriculture at Alfred and St. Lawrence universities, and others. The grange, boards of trade, newspapers, schools, clergymen, and others cooperated in making the trip a success. It is estimated that about 8,500 people visited the train.

Ohio Station.—Dr. Adolf Lehmann, for the past 10 years director and chemist of the Department of Agricultural Chemistry at Mysore, India, has accepted the position of assistant in nutrition investigations.

Oregon College and Station.—What is reported as the largest and most complete demonstration train ever sent out in this country traversed the Willamette Valley, November 4–11. The train contained 7 cars, equipped with a large amount of illustrative material, and was manned by a corps of experts from the college and station staff. Demonstrations were given of a milking machine and other dairy appliances, using a pure-bred Ayrshire and a pure-bred Jersey from the college herd; and also of pruning, grafting, and packing apples, together with talks and exhibits on farm crops, insects, and fungus diseases, and other phases of agricultural work. Much interest was aroused among the merchants, commercial organizations, and the general public, as well as among farmers, in many towns the stores being closed in honor of the occasion. It is estimated that over 20,000 people visited the train on its trip.

George Coote, professor of floriculture and gardening from 1887 until compelled by failing health to accept leave of absence in May, 1908, died November 12, at his home in Yaquina. Professor Coote was born in England in 1842. As college landscape gardener he was largely instrumental in laying out and improving the college campus.

Rhode Island College and Station.—In addition to its Adams fund work the station is now carrying on investigations with pigeons and other birds for the purpose of studying the inheritance of some of the more definite characteristics, and is also engaged in the study of the hybridization of distinct species.

An effort is being made to form an agricultural experimental union on essentially the same plan as similar organizations elsewhere. Ground has been broken for the new dormitory and dining hall.

National Association of State Universities.—At the convention held at Washington, D. C., November 16 and 17, the committee reports and papers considered were chiefly concerned with administrative matters in connection with State universities. Of these two dealt with problems having an important bearing on institutions for agricultural education, viz, the report of the committee on standards, and a paper on university extension in State universities. The report of the committee on standards, which was preliminary in nature, defined the standard American university as an institution (1) requiring for admission the completion of a standard American high-school course of four years (not less than 14 units of 5 periods each); (2) offering in the College of Liberal Arts and Sciences two years of general work completing or supplementing the high-school course; (3) offering further two years of university work leading to the bachelor's degree, and "reaching forward to the continuation of this work in the graduate school or the professional school;" (4) offering professional courses in law, or medicine, or engineering, based upon the completion of two years of college work, and (5) offering in the Graduate School an adequate course leading to the degree of Doctor of Philosophy. The committee recommended further that not less than 60 units of college work be required for the bachelor's degree; that the qualifications of teachers in the high school should be not less than the bachelor's degree and ought to be the master's degree; that as a rule professors of all grades of college work should have the degree of Doctor of Philosophy or its equivalent; that professors giving instruction in graduate work should further show their scholastic ability by successful research and publication, and by demonstration of their ability as teachers; that adequate libraries, laboratories, and other equipment should be provided; that three years or 45 units from the beginning of the junior year be required for the degree of Master of Arts, and five years or 75 units for the degree of Doctor of Philosophy and with work in residence; and that to be a standard university an institution shall be equipped to give instruction leading to the degree of Doctor of Philosphy in at least five departments and shall have at least one university professional school requiring two years of college training for admission.

The paper on University Extension in State Universities was presented by L. E. Reber, Director of Extension Work in the University of Wisconsin. This dealt largely with the extension work conducted by that university, which is planned to reach ultimately all classes of people in the State. There will be a central organization reaching out to all parts of the State through lectures, publications, demonstrations, correspondence, various traveling equipments, the services of specialists and traveling teachers, study outlines, and reading and correspondence courses. The State will also be divided into districts, in each of which there will be a university representative with assistants. The plan is a very elaborate one and seems to be well designed to extend greatly the influence of the university. Some of its features as applied to agricultural extension work have been previously noted (E. S. R., 19, p. 798).

Agriculture at the Baltimore Meeting of the American Association for the Advancement of Science.—This meeting of the association, which was held during the week beginning December 28, 1908, was largely attended, the registration reaching nearly 1,100. In addition to section meetings covering practically the entire field of pure science and a large part of the field of applied science, about 35 scientific societies, many of them affiliated with the association, held meetings at the same time.

Several of these societies are primarily interested in science as applied to agriculture, and included in the programmes of nearly all of the sections and societies were papers of direct interest to agricultural science, indicating a rapidly growing realization of the interest and importance of such problems as subjects of scientific research. Of the more than 1,000 papers presented, at least 150 were of this class, many being by workers in this Department and the agricultural colleges and experiment stations.

Especially important and interesting features of this meeting of the association were the celebration of the hundredth anniversary of the birth of Charles Darwin and the fiftieth of the publication of Origin of Species, and a symposium on public health, at both of which addresses of the highest interest were delivered.

In the address of the retiring president, E. L. Nichols, of Cornell University, on Science and the Practical Problems of the Future, attention was called to the approaching end of many of our available resources, and it was pointed out that in obtaining the power necessary for material advancement the inventor and the engineer can but utilize and apply the knowledge which the man of science can supply. The endowment of universities purely for research was advocated as essential to the work of conservation.

American Chemical Society.—The presidential address, by M. T. Bogert, touched upon the same ground as that of Professor Nichols, the subject being The Function of Chemistry in the Conservation of Our Natural Resources. H. J. Wheeler, director of the Rhode Island Station, as chairman of the section on agricultural and food chemistry, made a thoughtful and suggestive address on The Future of Agricultural Chemistry, in which he pointed out the need of better provision for the advanced and systematic training of agricultural chemists and urged that such training should be provided in the larger universities, believing that such institutions are at the present time better prepared to give such training than the agricultural colleges. He laid particular stress upon the importance of broad and thorough fundamental scientific training for agricultural research.

A large proportion of the papers presented before the society were related directly to subjects of agricultural importance. In two sections, namely, that of agricultural and food chemistry, which was raised to the grade of a division of the society at this meeting, and that of the recently established section of fertilizer chemistry, the programme was devoted exclusively to such subjects, about 31 papers being presented; and there were also several in the division of industrial chemistry and chemical engineering and the section of physical chemistry.

The character of the proceedings and papers of this meeting give evidence of a marked tendency toward the development of applied chemistry not only with reference to agriculture, but also to other technical industries.

Society of American Bacteriologists.—The opening address was by H. L. Russell, director of the Wisconsin Station, on the ecology of micro-organisms. The speaker advocated a broader treatment in elementary courses in bacteriology, believing that more attention should be paid to the environmental conditions and less to a discussion of species.

A number of the papers dealt with the bacteriology of dairy products. H. A. Harding, of the New York State Station, explained the advantage of using the society's card in classifying and identifying species of bacteria in cheese. W. M. Esten, of the Connecticut College and Station, exhibited charts showing great variation in the acidity of milk from Jersey cows as compared with Holstein milk. Dr. Otto Rahn, of the Michigan College and Station, reported results of investigations on the keeping qualities of butter.

S. E. Prescott, of the Massachusetts Institute of Technology, reported on a study of types of bacteria found in fermented milk products prepared for therapeutic use. E. G. Hastings and B. W. Hammer, of the Wisconsin Station, believed that organisms closely resembling *Bacillus bulgaricus* are constantly found in milk, butter, and cheese, and they ascribed the therapeutic value of the fermented drinks to their chemical composition rather than to the presence of the peculiar organisms. Dr. Carrington, of Turkey, believed the value of yoghourt or matzoon to be due to flushing the intestines, as the beverage is used in that country for all diseases, and patients are urged to drink as much of it as possible.

C. E. Marshall described a cremating furnace for laboratories that had been successfully used at the Michigan College. Dr. Hastings reported the keeping of anthrax spores for 8 years in raw pond water. P. B. Hadley, of the Rhode Island Station, gave the results of studies of white diarrhea in chicks. L. F. Rettger, of Yale University, described a new species of bacterium which is pathogenic in poultry.

Association of Economic Entomologists.—At the twenty-first annual meeting of this association, S. A. Forbes, in his presidential address, on the prospects of progress in Economic Entomology, contrasted the status and conditions existing at the time he was president of the association 15 years ago with those of to-day. A redraft of the constitution was adopted and the name of the association altered to American Association of Economic Entomologists. A large number of common names of insects taken from a list submitted by the committee on nomenclature were accepted. The committee on testing proprietary insecticides reported on the status of the proposed National insecticide law. Resolutions were adopted regarding the deaths of Drs. James Fletcher and W. H. Ashmead, and Profs. F. H. Snow, Alexander Craw, and W. G. Johnson, all of whom were members of the association.

Papers were presented by R. I. Smith, of the North Carolina Station, Edith M. Patch, of the Maine Station, F. L. Washburn and H. J. Franklin, of the Minnesota Station, R. A. Cooley, of the Montana Station, E. D. Sanderson, of the New Hampshire Station, P. J. Parrott, of the New York State Station, H. E. Summers and R. L. Webster, of the Iowa Station, T. B. Symons, of the Maryland Station, E. S. G. Titus, of the Utah Station, W. E. Hinds, of the Alabama Station, E. P. Taylor, of the Missouri Fruit Station, A. L. Quaintance, F. M. Webster, A. D. Hopkins, J. G. Sanders, C. E. Hood, and B. N. Gates, of the Bureau of Entomology of this Department, and by State entomologists E. P. Felt, of New York, Franklin Sherman, Jr., of North Carolina, and E. L. Worsham, of Georgia. In these the results of biological studies were given of *Murgantia histrionica*, *Pemphigus tesscllata*, cranberry pests, and soft scales, and in papers taking up more particularly the economic side were considered house-flies, forest insects, *Empoasca mali*, *Lygus pratensis*, codling moth, tree crickets, San José scale, *Conotrachelus nenuphar*, and an alfalfa leaf weevil. Papers were also presented on methods for securing apicultural statistics, on photomicrography and insect photography, plans for parasite breeding cages, determining the effect of hydrocyanic-acid and carbon-bisulphid gases upon plant and insect life, and on the importance of proper methods of entomological investigations. A discussion of the question Do We Need the Insectary? was entered into by a large number, most of whom considered such equipment a necessity. One of the important developments of the meeting was brought out by E. S. G. Titus, in relation to an imported alfalfa leaf weevil that is becoming a source of great injury to that crop in Utah. This pest is supposed to have been introduced into this country from Europe.

The following officers were elected for the ensuing year: President, W. E. Britton; 1st vice-president, E. D. Ball; 2d vice-president, H. E. Summers; secretary, A. F. Burgess. The meeting was the largest yet held, there being an average attendance of over 100 each day.

Entomological Society of America.—This was the third annual meeting of this society, W. M. Wheeler presiding. Of special interest to the economic entomologists were the accounts and investigations of *Toxoptera graminum* and its parasites, by F. M. Webster, habits of seed infesting Chalcis-flies, by C. R. Crosby, recording and mapping entomological fauna of the State, by Franklin Sherman, Jr., and notes on the host relations of ticks, by W. A. Hooker.

Henry Skinner was elected president, Herbert Osborn and A. D. Hopkins vice-presidents, and J. C. Bradley secretary and treasurer for the coming year.

American Association of Horticultural Inspectors.—The seventh annual meeting was held December 29–30. Among the questions of interest taken up and discussed were those of a National importation inspection law, the desirability of a uniform inspection law for the several States, and methods of certification and of disinfection of nursery stock, and methods for preventing the dissemination of the strawberry root-louse, Argentine ant, peach yellows, and crown gall. F. L. Washburn, of the Minnesota Station, was elected president and T. B. Symons, of the Maryland Station, secretary for the coming year.

Agricultural Economics at the American Economic Association.—The meeting of this association was held at Atlantic City, N. J., December 28–31, 1908. One of the sessions was devoted to agriculture, the following papers being presented: Economic Geography and Agricultural Economics, by E. V. Robinson, University of Minnesota; Cooperative Marketing of Agricultural Products, by Dr. J. L. Coulter, University of Minnesota; The Economic Limitations of Cooperation in the Marketing of Agricultural Products, by J. B. Morman of this Office; and The Relation of Speculation to the Marketing of Agricultural Products, by H. C. Emery, Yale University. A discussion, led by T. N. Carver of Harvard University, followed the papers, which will be published in the proceedings of the association during the year.

American Home Economics Association.—Following a meeting of the Teachers' Section of the Lake Placid Conference for Home Economics, held in Washington on December 31, the American Home Economics Association was organized, with its aim, as expressed by the constitution adopted, the furtherance of the study and consideration of home problems and the uniting for more effective work of all those interested therein. The following officers were elected: President, Mrs. Ellen H. Richards, of the Massachusetts Institute of Technology; vice-presidents, Miss Isabel Bevier, of the University of Illinois, C. F. Langworthy, of this Office, and Miss Mary Uri Watson, of the Ontario Agricultural College; secretary-treasurer, Benj. R. Andrews, of Teachers' College, New York.

The first public meeting of the association was held at George Washington University, on the morning of January 2, at which addresses were made by several speakers. Elmer E. Brown, U. S. Commissioner of Education, pointed out the important work which the association might do by showing home-makers and school children throughout the country how the technical, scientific knowledge for which it stands may be practically applied to increase their physical and moral, as well as their intellectual, welfare. He was followed by A. C. True, of this Office, who spoke of the timeliness of the formation of the association at a period when the interest in home science was increasing so rapidly and when the need was being felt for some regenerative influence in American home life. He suggested as three appropriate lines of

work, research into the problems of home economics, improvement of educational methods, and diffusion of information among the masses of our people. Congressman C. R. Davis, of Minnesota, also urged the importance of making available to the great body of our people the technical information regarding the problems of home-making which now seems largely confined to specialists, and discussed the "Davis Bill," now before Congress, particularly in its relation to the development of secondary instruction in home economics. A resolution was later adopted by the association indorsing the legislation suggested.

John Hamilton, Farmers' Institute Specialist of this Office, vigorously urged upon the meeting the need of bringing before the women in our rural regions definite and practical suggestions for lightening the monotonous and continuous physical labor which housekeeping means to many of them. Following him, Mrs. Mary Hinman Abel, of Baltimore, put in a plea for aid for the city homemakers, suggesting that well-managed laundries, cook shops, and employment bureaus would do much toward solving household problems. It had been expected that Gifford Pinchot, of the Forest Service of this Department, would speak in reference to the Commission on Country Life and its interest in work akin to that of the association, but he was unable to be present.

At the final session a resolution was adopted strongly urging the continuance of the nutrition investigations of this Office.

Conferences were also held on various phases of household economics, and a lecture on Household Arts was given by A. W. Dow. The active and widespread interest manifested in the association is evidenced by the fact that over 125 delegates from outside of Washington were registered at the meetings and that 800 persons have sent in their names for membership.

American Society of Animal Nutrition.—As an outgrowth of a conference of teachers and investigators in animal nutrition at the 1908 Graduate School of Agriculture, a meeting was held at Chicago, November 28, in connection with the International Live Stock Exposition, with about 30 college and station workers in attendance. An organization was effected, its purpose being defined as "to improve the quality of investigation in animal nutrition, to promote more systematic and better correlated study of feeding problems, and to facilitate personal intercourse between investigators in this field." In addition to holding an annual meeting, the society purposes taking up actively the consideration of methods of investigation and later entering upon cooperative study of important problems of stock feeding. Officers of the new society are announced as follows: President, H. P. Armsby; vice-president, C. F. Curtiss; secretary-treasurer, D. H. Otis; registrar, J. T. Willard; committee on experiments, H. J. Waters, H. W. Mumford, T. L. Haecker, E. B. Forbes, and W. H. Jordan.

International Live Stock Exposition.—The ninth exposition of the International Live Stock Association, held in Chicago, November 28–December 10, was again a notable success. In spite of the quarantine of several States on account of the outbreak of foot-and-mouth disease, 20 States, together with Canada, Mexico, England, and Belgium, were represented by entries including over 3,000 animals, and in most of the classes the quality showed continued improvement over previous years.

The influence of the agricultural colleges and experiment stations was quite as strongly in evidence as ever. Their staffs furnished six members of the corps of judges, their students were again a prominent and distinctive feature, and their exhibits were distributed through nearly every class of entry, figuring even more largely than in former years in the prize winnings, easily predominating in the fat stock classes and achieving several grand championships, among them the highly coveted championship of the single steers.

In the fat barrow class the grand championships both for single barrows and pen of 3 were won by Berkshires from the Iowa College, which also furnished the champion Poland China and large Yorkshire single barrows, the champion Duroc Jersey pen of 3, and the champion carload of from 150 to 200 lbs. in weight, besides a large number of class prizes. The champion pen of Chester Whites and the champion Duroc Jersey single barrow were from the Wisconsin University, which also won a long list of class prizes. The Ohio University showed the champion pen of large Yorkshires and won several prizes in other classes as did also Purdue University.

The exhibit of fat wethers from the Wisconsin University was especially noteworthy and won a large number of prizes, among them the championships for pens of Shropshires and Cheviots, for single wethers in Hampshires, and for the champion dressed carcass of the show. Iowa received a second prize for a pen of Southdowns.

For fat cattle the Nebraska University won, in the Shorthorn classes, first on senior yearlings, and Ohio first on junior yearlings, and other prizes went to Missouri, Minnesota, Iowa, and Ohio. On Aberdeen Angus herds, the Kansas College won first with Minnesota second, Nebraska third, and Iowa fifth. On two-year-olds the Kansas College was first, Purdue second, and Nebraska third; on yearlings, Minnesota first, Purdue fourth, and Kansas fifth: and on calves, Kansas first, Nebraska second, Iowa fourth, and Missouri fifth. The breed championship for single steers was again won by the Minnesota University. On Hereford two-year-olds the Nebraska University won third place and Purdue fourth.

The Missouri and Nebraska universities were strongly in evidence in the Galloway classes, the former winning the herd championship, first on yearlings, and second on two-year-olds and calves, and the latter receiving second on herd, first on calves, second on yearlings, and fourth on two-year-olds. Purdue won third and Ohio fourth on yearlings, and Kansas third on calves.

In the grades and cross breds the Iowa College won first on herd, second on two-year-olds, second and fourth on senior yearlings, third and fourth on junior yearlings, third and fifth on senior calves, and second on junior calves. Nebraska received thirds on herd, two-year-olds, and senior yearlings, and Missouri fourth on two-year-olds and second on junior yearlings.

Upon the final assembling of the winners from all breeds, champions were as usual chosen for the groups by ages, and two of the three selected were from the college entries. For the two-year-olds the Angus Fyvie Knight from Purdue was selected, thereby reversing an earlier decision in which first place for Angus two-year-olds had been given to Ideal from the Kansas College. Symboleer, also an Angus from the Kansas College, received the calf championship. The grand championship for all breeds and ages fell to Purdue on Fyvie Knight. The Iowa College won the herd championship with Kansas third.

In the cattle slaughter tests an innovation was the antemortem rating of the animals from the killing standpoint. In this, first place in the two-year-old class went to an entry from the Minnesota University, with Iowa third, and Missouri fourth, and in the yearling class Iowa received second and fourth place. Upon a regrading of the carcasses after slaughter, with the criterion largely the requirements of the general trade, the ratings were very much altered, Nebraska receiving first and Missouri second on two-year-olds, and Iowa fifth on yearlings.

In the carload lot competition a load of "short fed" Angus yearlings fed by the Purdue Station under known conditions attracted much attention and was regarded as a valuable demonstration.

The entries of horses from the colleges were much less numerous than those of fat stock. With Clydesdales Iowa received fifth prize for aged stallions and third for yearlings.

In the special class for college and station stock the competition was, as usual, exceedingly close. With cattle, Purdue won first for two-year-olds and the championship for single steers with Fyvie Knight. Kansas won second place on two-year-olds, with Nebraska third, and Iowa fourth. For cattle one to two years old, the winner was Minnesota, followed by Iowa, Nebraska, and Missouri. For calves, Kansas won first, Minnesota second and fourth, and Iowa third. The herd championship was won by Iowa. Wisconsin took all the prizes for sheep except third on wether lambs which went to Iowa. Purdue received second and Iowa third for barrows under 12 months, and the remaining prizes for hogs went to Iowa.

The usual large attendance of students led to the remark from *The Breeders' Gazette* that "more and more the International is becoming an elective course in the curriculum of agricultural colleges." The judging contests were participated in by teams from eight institutions and several others were represented in the crowd of spectators and at the annual meeting of the American Federation of Agricultural Students, which was held December 1. In the contest for the trophy offered for the highest total scores in judging horses, cattle, sheep, and swine, first place was awarded to the Iowa College, the remaining competitors in order being, Nebraska, Texas, Missouri, Kansas, Ohio, Ontario, and Minnesota.

The Armour scholarships contingent upon these contests and upon the prize winnings of the colleges and stations have been awarded, Iowa receiving 7, Nebraska and Wisconsin 3 each, Purdue 2, and Kansas, Minnesota, Missouri, Ohio, and Texas one each.

National Dairy Show.—The third National Dairy Show was held in Chicago, December 2–10. The cattle exhibits included 6 breeds from 10 States, the entries being appreciably curtailed by the quarantine for foot-and-mouth disease. The milk and cream contest held under the management of the Dairy Division of this Department brought forth 70 entries, representing 20 States scattered from New Hampshire to Utah, the number and quality of the entries showing a marked improvement over those of the previous contest in 1906. There were also extensive exhibits of dairy machinery.

Special programmes were prepared for creamery and cheese-factory managers and secretaries, milk dealers, and dairy farmers, with addresses by Chief E. H. Webster and H. Rabild of the Dairy Division, E. K. Slater of the Minnesota University and Station, several State dairy and food commissioners, and others. A students' dairy stock-judging contest was participated in by teams from the agricultural colleges of Iowa, Kansas, Minnesota, Missouri, Nebraska, New York, Ohio, South Dakota, and Texas. The sweepstakes trophy was won by the Iowa College, with Nebraska second and Minnesota third. Special breed trophies were also competed for, Nebraska winning for Jerseys, Cornell for Holstein-Friesians, and Iowa for Guernseys and Dutch Belted stock.

An informal meeting of the National Association of Dairy Instructors and Investigators was held in connection with the show, with about 35 in attendance.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

CONTENTS OF VOL. XX, NO. 6.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Cont'd.

U. S. Department of Agriculture.

EXPERIMENT STATION RECORD.

VOL. XX. FEBRUARY, 1909. No. 6.

The report of the Secretary of Agriculture for 1908, in addition to reviewing the work of the Department for that year, presents a most interesting and instructive epitome of the progress of agriculture in the United States during the past twelve years, and of the principal causes which have contributed to the phenomenal growth recorded. Among the agencies to whose activities this progress is due the Secretary includes not only this Department "but also the experiment stations, the agricultural schools and colleges, the State boards and commissioners, the agricultural press, and the farmers themselves in their individual and collective efforts."

"Momentous changes," the Secretary states, "have occurred to agriculture in this country during the last dozen years. Features of great import have been introduced. Forces have become operative whose results are already enormous, with the certainty of cumulative and accelerated future consequences for the Nation's good and well-being. The farmer's work and harvest have had the benefit of more varied knowledge and more effective intelligence. His life and living have undergone transformations which increasingly make the farm preferable to the town.

"This period has developed an amazing and unexampled prosperity for the farmer. His improving financial condition has been both an effect and a cause—an effect partly of his own efforts joined to those of public agencies, and also the means of making his life and the lives of his wife and children the better worth living."

The Secretary shows in some detail how the period referred to has been marked by a change from low to profitable prices for farm products and how, "relieved of the weight of debt and of suffering under unprofitable prices, the farmer felt more responsive than before to the help offered by the Department of Agriculture, the experiment stations, and other sources during the period under review. Thousands of learned investigators worked for him. Thousands more talked to him repeatedly. Thousands of demonstrations taught how to do by doing. Many boys were educated in agriculture. Hundreds of millions of copies of publications were sent broadcast."

One of the most important results of these systematic and widespread efforts to apply science to the practice of agriculture has been

the remarkable improvement in practical methods of breeding plants and animals, for "during the past dozen years breeding has passed the unorganized stage and has come under the domain of science." The work in plant breeding has given definite results not only in the production of better yielding varieties of many important crops, but has also produced varieties more resistant to disease and unfavorable climatic conditions, as well as those of higher market quality.

In the field of animal breeding "cooperation of the Department with State stations and farmers has begun to create new strains of farm animals—carriage horses, in Colorado; cattle for beef production under southern conditions, in Alabama; the cross of the horse and the zebra, in Maryland; the reestablishment of the Morgan breed of horses, in Vermont; sheep especially suited to range conditions, in Wyoming; a breed of milking Shorthorn cattle, in Minnesota; draft horses, in Iowa; improved Holstein cattle, in North Dakota; a breed of hens for high egg production, in Maine."

No small part of the improvement of agricultural production during the period named has been due to systematic efforts to discover and introduce promising seeds and plants, and it is stated that "from this one feature of the Department's work many millions of dollars are added yearly to our national production of wealth."

The question of farm management is one of immense importance, and it is stated that through the efforts of the State experiment stations, colleges of agriculture, and the Department of Agriculture this complicated subject is being put on a scientific basis.

"The planning of a new farm or recasting the field plan of the old farm are being reduced to such form that they are profitably taught in agricultural schools. A number of the experiment stations have determined the kinds of crop rotations which yield the largest net returns for given soils and agricultural districts. Numerous long-time experiments on State and branch experiment station farms controlled by the Department are under way to determine those crop rotations and other methods of internal management of the farm which will be most profitable and best adapted to the family and other available labor. . . . Along this line of work important progress has been made in aiding the farmer to put into practice results of scientific discovery."

The improvements in agriculture have not been confined to increasing the productive capacity of the area under cultivation, but have extended to the reclamation and profitable utilization of large areas hitherto considered worthless for agricultural production. This is probably best illustrated in the great progress that has been made during the period under consideration in the introduction of methods of dry farming in the vast region included in the arid part of the Great Plains. Under the guidance of the Department and the

State experiment stations this region is rapidly becoming one of considerable agricultural importance, and dry farming has come to be recognized as an important factor in our future agricultural progress.

In discussing the present and future of irrigation and dry farming, the Secretary makes the following significant statements: "In 1896 the irrigated acres in this country numbered about 8,000,000; in 1908 the number was about 13,000,000, and when projects now in the course of execution by the Reclamation Service and by private individuals under the Carey Act are executed, the total irrigable area will be 18,000,000 acres. It therefore appears that during the period under review steps have been taken and much progress made toward placing under cultivation immense areas of desert land by means of irrigation and of so-called 'dry land' by means of suitable cultural systems. The foundation has already been prepared for the advent of millions of people on previously unproductive land to pursue agriculture in many of its features under conditions which promise prosperity and an enormous addition to the Nation's permanent wealth and to its annual production. In these two lines of agricultural development, in which this Department has already been concerned in the agricultural phases, there is much work for it in the future."

In harmony with the growing sentiment in favor of better conservation and utilization of our natural resources, "instruction in the conservation of the soil and its fertility by all available means has been incessantly carried on by the Department, the experiment stations, agricultural colleges, and by private publications."

A fuller knowledge has been gained of the nature of plant diseases and of the immense losses they cause and their ravages "have been suppressed and avoided during the period under review in a far greater degree than ever before. A true science of plant pathology has been founded and the discovery of the causes and treatment of diseases has led to many improvements in mechanical methods of utilizing fungicides. Still greater advances have been made in the direction of plant sanitation, and improvements in the environment of plants as well as in the plants themselves have increased production, both in quantity and in quality. No part of the work of the Department and the experiment stations yields a more direct cash return than this."

The Secretary's review shows in brief the great progress that has been made in the period considered in the discovery and introduction of effective methods of control of injurious insects by means of natural enemies, insecticides, and improved methods of farm management; in the acquisition and dissemination of more exact knowledge regarding useful and injurious birds and other wild animals; in improving methods of marketing farm products; in control of animal diseases and inspection of meat products; in improving dairy meth-

ods; in road improvement; in developing the efficiency of the Weather Bureau and improving the weather forecasts and extending their distribution; in the application of chemistry to agricultural production and to the detection and prevention of fraud and adulteration in food products and drugs.

"Increased and wider knowledge of the nutritive value of food and of the better utilization of agricultural products as human food has followed the nutrition investigations of this Department, in cooperation with the experiment stations and other State institutions.

"Animal nutrition investigations, begun in cooperation with the Pennsylvania experiment station, are accumulating most accurate and scientific information, developed by use of the respiration calorimeter, an instrument invented by experts of this Department."

The remarkable growth of the Forest Service in recent years and the rapid development of a comprehensive national forest policy is strikingly emphasized in the statement that "for Americans ten years ago forestry had neither a practical basis nor practical interest. On July 1, 1898, there were two professional foresters in the employ of the Government, less than ten in the whole country, no school of forestry on the Western Hemisphere, no scientific knowledge of the first principles of American practice in existence. The very word forestry was usually meaningless except as it was misunderstood."

It is shown, however, that between that date and the present time there has been a complete and rapid change in the attitude of the public toward the forests, and that while in 1897 the number of persons employed by the Department in forestry work was only 14 and not an acre of forest land was then under the management or control of the Department, the number of persons now employed in the Forest Service is 3,753, and the area of the National Forests now aggregates almost 168,000,000 acres, paying annually into the Treasury of the United States over $1,800,000. This enormous growth of the forestry work of the Department has been accompanied by increased activity by State agencies and the development of forestry work by the agricultural colleges and experiment stations.

As concrete evidence of the rapid growth of the Department, it may be stated that while "in 1897 the number of publications issued by the Department was 424, of which 6,541,200 copies were distributed, in 1908 the 1,522 publications of the Department were distributed to the number of 16,875,516. During the eleven years following 1897 this Department has printed 10,449 publications, including reprints, the distribution of which amounted to 129,129,633 copies."

In the same time the Department library has grown from 56,000 to 115,000 books and pamphlets, constituting perhaps the most complete agricultural library in the world.

The growth of the Department is also shown by the fact that while "on July 1, 1897, 2,444 persons were employed, eleven years later, in 1908, the number was 10,420, or over four times as many."

The general educational influence of the work of the Department and of the agricultural colleges and experiment stations has grown rapidly and become far-reaching during the period reviewed. One educational result of great importance has been the training of an efficient corps of workers prepared to guide future advances in agricultural education and research.

The Secretary gives the following striking figures regarding the development of agricultural education:

"The total income of the agricultural colleges was $5,000,000 in 1897, $15,000,000 in 1908; the value of their property was $51,000,000 in the former year and $96,000,000 in 1907. The students in 1897 numbered 4,000; in 1908, 10,000.

"One agricultural high school existed in 1897, and there are now 55. Not one normal school taught agriculture in 1897, but now 115 do so, besides many privately endowed schools. About half of the agricultural colleges now give training courses for teachers in agriculture; 44 States and Territories give some instruction in elementary principles of agriculture in the lower schools. The Graduate School of Agriculture for instruction of investigators and for discussion of advanced problems of research in agriculture was organized in 1902, and is now doing work under the Association of American Agricultural Colleges and Experiment Stations. A strong movement for the systematic organization of all agencies in agricultural extension work has been started within a few years, and the National Education Association has added a department of rural and agricultural education.

"Outside of schools which are for the education of youth and teachers in agriculture, the farmers have received a greatly increased degree of education by means of demonstration work and advice given orally and by letter, by countless official and private publications, by corn and live-stock judging contests, and by farmers' institutes. The number of sessions of the last named held in 1908 was 14,000, with an attendance of about 2,000,000 persons, an enormous increase over the attendance twelve years ago. About 1,200 trained lecturers are now employed in farmers' institute work in all States and Territories."

In concluding this review of the "tangible evidences of the beneficial results of the gigantic movement in agricultural instruction and improvement, of the unprecedented uplift of the farmer, and the betterment of country life," the Secretary calls attention to the interesting and important fact "that this country is passing

through historical phases of agricultural production. First comes the exploitation of virgin land by the soil robber, a proceeding that is justified by the poverty of the settler or his lack of capital; next is the diminished production per acre, which surprises the farmer, and for which he is unable to account; next is the receipt of information from the scientist as to the means of improving the productivity of the land, with slow response; in the course of time, especially when the next or perhaps the third generation takes the farm, important advances are made, at first irregularly and mostly on the farms of the leading farmers, and subsequently with increasing diffusion and accelerated speed.

"In the case of all crops for which production per acre is known, there was an increase during the last ten years and also, in a somewhat less degree, in the case of most of them, during the last twenty years. This is the general fact for the United States in spite of the damaging effect on the general average by reason of decreasing production per acre from land that has not yet entered upon the final historic stage of agriculture.

"The farmers of this country have now made a creditable beginning in this last phase of historic agriculture. It is now a movement of masses as well as of leaders. It is more and more a diffused movement in place of being broken up into localized efforts. This movement has gained most of its headway during the last twelve years. Increased production per acre is clearly indicating the extent and force of this uplifting movement. . . .

"No one need fear that the farmers of this country will ever be unable to provide for its population. They are already demonstrating in the cases of various crops and of various States that they can provide for a population increasing faster than by increase due to excess of births over deaths."

Taking all the facts into consideration, the Secretary draws the broad general conclusion "that agriculture has made wonderful progress and permanent advancement, and that the farmer in results of information, intelligence, and industry has thriven mightily" during the last dozen years. "The progress that has been made is in the direction leading to popular and National welfare, to the sustenance of any future population, as well as to a larger efficiency of the farmer in matters of wealth production and saving, and in establishing himself and his family in more pleasant ways of living."

From the standpoint of the agricultural scientist, the most interesting fact regarding the foregoing review of the recent agricultural progress of the United States is that it is inseparable from the record of the growth and development of our institutions for agricultural education and research. The period of the most effective work of these institutions is the same as that covered by the Secretary's re-

port. During that period these institutions have secured the attention of great numbers of intelligent farmers in every State and Territory. As agricultural prosperity has increased the farmers themselves have taken increased interest in securing larger grants of public funds for agricultural education and research and have cordially supported the managers of colleges, schools, and experiment stations in building up these institutions.

The directions in which agricultural progress has been made have also borne clear evidence of the practical benefits derived from science applied to agriculture. It is therefore impossible to make any accurate account of our agricultural progress in recent years without giving a large place to the results of experimental inquiries and to the relations of science and education in aiding advances in this industry. So far from exhausting the store of material which might have been drawn upon, the Secretary has been compelled by limits of space to confine his résumé to the larger and more striking features of scientific, as well as practical, interest and to treat these in the broadest outline.

An important feature of the development of the Department, as related to its material equipment, to which the Secretary's report calls attention, is the completion of the new Department building. This building, for which Congress appropriated $1,500,000 in 1902, was begun in 1904 and completed in March, 1908. Upon completion of the building steps were "immediately taken toward its occupancy by the various Bureaus of the Department, which were very inadequately housed in scattered buildings rented by the Department." The building consists of two L-shaped wings designed especially for laboratory use which it is planned to connect by a central part to be used for administration purposes.

The wings each have a frontage of 256 feet with an L extending to the rear 100 feet. They are four stories in height above a high basement, and all the floors are made readily accessible by three elevators in each wing. There are twenty-five working rooms on each floor, and the total floor space provided by each building is eighty thousand square feet including the corridors. This leaves about fifty-five thousand square feet in each wing available for office and laboratory rooms. The corridors are wide and well lighted.

The construction is of the most substantial kind and is fireproof throughout. The exterior walls are of marble and of solid masonry, and those on the court side of light brick with marble trimmings.

Each room is so arranged that it can be readily converted into a laboratory, although at present many of the rooms are occupied as offices. Provision is made for supplying each laboratory room with hot and cold water, distilled water, gas, live steam, compressed air

and suction, as well as with electricity for light and power; and there are openings for connecting telephones and call bells. The supply pipes are carried just below the ceiling so that they in no way interfere with office equipment and lead to pipe shafts provided with doors so that the risers are easily accessible. A power house has been erected in the court from which heat is supplied, and where all pumps and machinery for maintaining the service are located. The building is heated by indirect radiation, and a system of room ventilation and of flues for fume chambers is provided throughout.

The new building accommodates only a part of the Department's force, so rapid has been the growth, even in the few years since the building was begun. In the east wing are located the Library, which occupies most of the basement floor, the Bureaus of Animal Industry and of Soils, and the Office of Experiment Stations. The latter has desirable quarters on the second floor, with two rooms in the basement for the respiration calorimeter. The space provided allows the bringing together of the various lines of work in charge of the Office, which in the past have been widely scattered.

The west wing is occupied by the Bureau of Plant Industry. The old main building and the building occupied by the Bureaus of Entomology and Biological Survey will be retained for the present. "Several structures in close proximity to the new building have been or will be removed, in accordance with the provisions of the original plan and appropriation for the building work. In carrying out this plan new quarters for shops, stables, and storage are being erected on the north side of the Department grounds, for which purpose a special sum was appropriated by Congress at its last session."

Not the least advantage of the new building will be the opportunity to bring the forces together which have steadily become more widely separated. This separation has greatly increased the difficulties of administration, and the necessity of adapting the small rooms of dwelling houses and flats to laboratory purposes has placed the work at a constant disadvantage.

In its completed form the new building will compare favorably in its architectural features (see E. S. R., 15, p. 947) with any that has been built for other branches of Government work and is well adapted to the purposes for which it was designed. It is such a building as will worthily typify the national importance of agriculture in this country.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

A wax acid from soils, O. SCHREINER and E. C. SHOREY (*Abs. in Science, n. ser., 28 (1908), No. 710, p. 190*).—This is an abstract of a paper presented at the recent meeting of the American Chemical Society at New Haven.

"In the examination of a black clay loam from North Dakota there was obtained by treatment with boiling 95 per cent alcohol a colored extract from which a microcrystalline precipitate separated on cooling. By washing with cold alcohol and recrystallizing, this can be obtained free of color. On drying this purified precipitate and treating with cold ether it is divided into two portions. The ether soluble portion crystallizes on evaporation of the ether in minute leaflets, melting at 72–73° C. The physical and chemical properties of this body place it among the fatty acids found in waxes. Elementary analyses correspond with the formula $C_{21}H_{42}O_3$, the hypothetical acid of a lactone found in carnauba wax. The name agroceric acid is proposed for this body."

The presence of a cholesterol substance in soils—agrosterol, O. SCHREINER and E. C. SHOREY (*Jour. Amer. Chem. Soc., 31 (1909), No. 1, pp. 116–118; abs. in Science, n. ser., 28 (1908), No. 710, p. 190*).—This is a paper presented at the recent meeting of the American Chemical Society at New Haven. It is stated that "when the alcoholic extract of the soil referred to [above] is separated from the precipitate, which forms on cooling, and is evaporated to small volume, a resinous dark-colored mass is obtained. Cold ether dissolves a portion of this, including the coloring matter. Spontaneous evaporation of the ether leaves again a resinous dark-colored mass. Treatment of this with cold absolute alcohol removes the coloring matter and leaves a white crystalline residue. Purification of this by recrystallization yields a body crystallizing in plates resembling those of phytosterol, melts at 237° and gives the cholesterol reaction with acetic anhydrid and sulphuric acid. Elementary analysis gave figures corresponding to the formula $C_{26}H_{44}O$. The name agrosterol is suggested for this compound."

Critical observations on the Schöne and Appiani methods of physical analysis of soils, G. DE LUCCHI (*Ann. R. Staz. Agr. Forlì, 1907, No. 36, pp. 19–29*).—As a result of comparative tests of these methods the author recommends the Appiani (decantation) method as preferable to the Schöne method on account of its simplicity and rapidity.

Application of the cobalti-nitrate method to the estimation of potassium in soils, W. A. DRUSHEL (*Amer. Jour. Sci., 4. ser., 26 (1908), No. 154, pp. 329–332; Ztschr. Anorgan. Chem., 59 (1908), No. 1, pp. 97–101; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 735; Chem. Zentbl., 1908, II, No. 13, p. 1126*).—In the application of the method already described (E. S. R., 19, p. 808) to the determination of potash in soils, a weighed quantity of soil is extracted on a water bath with 20 per cent hydrochloric acid, the acid removed by evaporation, and the bases separated by addition of sodium carbonate or ammonia and ammonium oxalate. The ammonium salts and organic matter are removed

by heating to redness, the residue dissolved in water, acidified with acetic acid, and evaporated with excess of sodium cobalti-nitrite. Further procedure is the same as already described.

Detection of ammonia in water, LAMBOTTE (*Jour. Pharm. [Antwerp], 1908, Mar. 31; abs. in Ann. Chim. Analyt., 13 (1908), No. 9, pp. 350, 351*).—The method proposed is based upon the coloration of the precipitate obtained with Nessler reagent in a centrifuge and not of the solution as in the ordinary method.

The estimation of phosphoric acid in food materials, RIETER (*Schweiz. Wchnschr. Chem. u. Pharm., 46 (1908), No. 35, pp. 546, 547*).—A critical discussion of methods.

What is the value of determining the ash content of honey by Ley's method, F. SCHWARZ (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 7, pp. 403–412*).—On the basis of his investigations the author reaches the conclusion that honey should be considered adulterated when it has an ash content of less than 0.1 per cent and also would appear to be artificial honey judged by the Ley test. See also a previous note (E. S. R., 20, p. 11).

The determination of malic acid in food products, H. W. COWLES, Jr. (*Jour. Amer. Chem. Soc., 30 (1908), No. 8, pp. 1285–1288*).—The method described is designed for use with maple sugar products. It is also applicable to fresh and boiled ciders and to cider vinegar. Calcium acetate with 95 per cent alcohol is used as a reagent. The precipitate is ignited, warmed with an excess of decinormal hydrochloric acid, cooled and titrated with decinormal sodium hydroxid.

The estimation of alcohol in fermented liquids, W. ANTONI (*Jour. Amer. Chem. Soc., 30 (1908), No. 8, pp. 1276–1278, figs. 3*).—A pycnometer, rinsing arrangement, and a method of distillation used in determining alcohol in fermented liquids are described.

The determination of cotton-seed hulls in cotton-seed meal, G. S. FRAPS (*Texas Sta. Bul. 109, pp. 3, 4*).—In the method proposed the sample is extracted first with ether and then with boiling water and sodium hydroxid. The residue is dried, ignited, and brought to constant weight, the loss in weight representing the insoluble residue.

Determinations of the insoluble residue found in 17 samples of meal after the hulls had been sifted out ranged from 8.22 to 13.33 per cent, with an average of 10.46. In 16 samples of meal of high purity but containing hulls, it ranged from 9.75 to 14.09, and averaged 11.38 per cent. In 20 samples of hulls it averaged 75.22 per cent. It is believed that a meal free from hulls should not contain over 10 per cent of insoluble residue.

The approximate amount of excess hulls present is estimated by subtracting from the percentage of insoluble residue found to be present 10 per cent and then adding one-third of the remainder.

Mitchell-Walker moisture test, J. W. MITCHELL and W. O. WALKER (*Ontario Dept. Agr. Bul. 167, pp. 12, fig. 1*).—The authors have devised a cheap but durable apparatus for use by the average factory man in moisture determinations in butter, cheese, and curd. This apparatus, which is so constructed that it can be easily taken apart and packed for use for the traveling inspector, is fully described and directions are given for making the test. The underlying principles are the use of a reagent to prevent the foaming of butter, the expulsion of the moisture by heat, and the condensing of the vapor in a receptacle where the amount can be easily read.

Amyl acetate is the reagent used, amyl butyrate, eucalyptol, and various distillation products of crude petroleum having been tried and discarded. The loss of moisture due to the reagent has been found to be approximately a constant

quantity rather than being proportional to the percentage of moisture in the butter. The time required to drive all moisture from a sample of butter or curd varies from 4 to 7 minutes.

Regarding the methods of investigations of butter and other fats, GRIMMER (*Milch Ztg., 37 (1908), Nos. 11, pp. 121–132; 12, pp. 133–144; 13, pp. 145–156; 16, pp. 181–192*).—The methods of determining the various physical and chemical constants of butter commonly used are considered and summarized.

Comparison of different methods of estimating the fat content of cream, M. KERSTEN (*Molk. Ztg., 22 (1908), No. 38, pp. 1083–1085*).—The methods compared are those of Adams, Gerber, Wendler, and Siegfeld, together with that by the use of the revolving balance described below.

A revolving balance, WENDLER (*Molk. Ztg., 21 (1907), No. 45, p. 1278, fig. 1*).—A description of a balance by which 6 flasks may be weighed at once, thereby effecting a saving of time in the volumetric estimation of butter fat.

Determining the energy value of urine, A. ZAITSCHEK (*Arch. Physiol. [Pflüger], 121 (1908), No. 8–10, pp. 550–557*).—As shown by the tests which the author reports, the energy value of urine can be accurately determined with a small bomb calorimeter of 70 cc. capacity.

Report of food commissioner and chemist, E. F. LADD (*North Dakota Sta. Rpt. 1907, pt. 2, pp. 9–164, figs. 9*).—The author reports the results of the examination of a large number of samples of preserves, jams, jellies, canned goods, cereal and breakfast foods, dried fruits, spices and extracts, meats, molasses and sirup, candy, alcoholic beverages, etc., under the provisions of the State law. Special attention is paid to the quantity of goods in cans, etc., as the State law now provides that every package, bottle or container shall display definite information regarding quantity. According to the author very few of the products sold in the State are now seriously adulterated, "but a great many are still misbranded, or, are not branded to show properly the true net weight or measure of the same."

A study of the character of burning oils carried on under the provisions of the State law led to conclusions summarized as follows:

"The flash point and fire test are means of safeguarding against the presence of gasoline and other light explosive products, but afford no complete protection against the sale of oils which are inferior as illuminants.

"The specific gravity, 46° B., now excludes an oil possessed of good illuminating power, while oils with a gravity of 47.3° B. are entirely worthless. Therefore, the gravity does not seem to indicate the true burning quality of an oil for illuminating purposes.

"To exclude the gravity test would work no hardship, but permit of the introduction of other oils, providing the photometric and distilling test be made an essential part of the enforcible features of the oil law.

"Changes in the specific gravity from 46° B. to 42° B., without any other safeguards, might result in the introduction of many inferior, even worthless, oils.

"The photometric test should be made an essential part of the law. . . .

"The distilling test should be emphasized, and at 310° F., not more than 6 per cent of the oil should distill over; and at 570° F., the residuum should not be more than 4 per cent.

"Not more than a trace of sulphur or other tar-like products should be permitted in oil intended for illuminating purposes.

"The Foster cup can not be recommended for the flashing test, but the Elliott closed cup should be made the standard.

"The oils tested, with the exception of [two samples] . . . , were all received from the State oil inspector, and represent the oils shipped into the State;

therefore, in no way tampered with, nor had they been stored by dealers in tanks not properly cleaned.

"The statement generally made that the housewife fails to keep her lamps properly cleaned, in the light of experiments heretofore reported upon, would not seem, in many cases, to be the real cause of failure to burn."

Division of pharmacy [report] by L. A. Brown (pp. 121–150, pls. 5).—Details are given of the examination of a large number of products and proprietary articles under the provisions of the State law.

Report of practical paint tests begun in 1905 by C. D. Holley (pp. 151–162).—The results of experimental tests of paint are summarized, but as the paints have been applied only for a year the author does not believe that final deductions can be drawn.

Annual report of the chemical section of the Hygienic Institute of the University of Halle, M. Klostermann (*Hyg. Rundschau, 18 (1908), No. 10, pp. 572–592*).—A report of the examination of a number of samples of meat and meat goods, milk, culinary fats and oils, water, wine, and other materials.

[Miscellaneous analyses]. E. F. Ladd (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 36–41, 42–44*).—In 102 samples of formalin analyzed the formaldehyde content was found to range from 38 to 41.62 per cent. Analyses are also reported of proprietary stock feeds, linseed meal, bran, middlings, Paris green, sugar beets, and a soft black mineral product that oozes from the earth in the locality of lignite coal veins.

Commercial Sicilian sumac, F. P. Veitch and B. J. Howard (*U. S. Dept. Agr., Bur. Chem. Bul. 117, p. 32, pls. 3*).—Sicilian sumac (*Rhus coriaria*) is the best vegetable tanning material known for pale colors and soft tannage. Sumac-tanned leathers are less likely to be attacked by light and gas fumes, hence are well suited for bookbinding. A good quality of Sicilian sumac is high priced and dealers have complained that stems and other material are added. The culture and preparation of sumac for market are described. Italian laws require that adulterated sumac shall be so labeled.

Samples were submitted to both chemical and microscopical analysis. Contrary to results of English chemists the largest percentage of tannin was obtained by extracting above the temperature of 60° C. The most common adulterant found was *Pistacia lentiscus*. Others less common are *Coriaria myrtifolia, Tamarix africana, Ailanthus gladulosa, Vitis vinifera*, and other species of Rhus.

"Approximately 41 per cent of the invoices from which samples were taken [in 1905] were mixed with lentiscus, this being practically the only adulterant employed, except sumac stems, which were present in excessive quantities in a number of samples. The adulterated samples contained from 19.6 per cent to 33.3 per cent and averaged 26.6 per cent of tannin, or 2.2 per cent less than the average of all the sumac samples. A number of the samples contained an excess of sumac stems, and the average tannin content of these was 29.9 per cent, which indicates that the stems are not added in such large quantities as is the lentiscus. The samples of pure sumac contained from 27.4 to 35.1 per cent and averaged 31.9 per cent of tannin."

Investigations of 1907 showed that 25 per cent of the 53 samples examined were adulterated. The average available tannin of the 53 samples was 29.4 per cent and of the adulterated samples 26.3 per cent. Tables of analyses and details of the methods of the examination are given. One of the most reliable indications of adulteration is the color of the dried sample, lentiscus darkening greatly on heating.

Official and provisional methods of analysis, Association of Official Agricultural Chemists, edited by H. W. Wiley (*U. S. Dept. Agr., Bur. Chem. Bul.*

107, rev. ed., pp. XXI+272, figs. 13).—This is a revision of Bulletin 107 of the Bureau of Chemistry, previously noted (E. S. R., 19, p. 506), embodying further changes suggested by the association and adopted at the 1907 meeting.

Proceedings of the twenty-fourth annual convention of the Association of Official Agricultural Chemists, held at the Jamestown Exposition, Norfolk, Va., October 9–11, 1907, edited by H. W. Wiley (*U. S. Dept. Agr., Bur. Chem. Bul. 116, pp. 143*).—This is the official report of the proceedings of the convention. A summarized account of the meeting has been given (E. S. R., 19, p. 294), and a circular of the Bureau containing extracts from the proceedings noted (E. S. R., 19, p. 1010).

METEOROLOGY—WATER.

The relations between the meteorological elements of the United States and the solar radiation, F. H. Bigelow (*Amer. Jour. Sci., 4. ser., 25 (1908), No. 149, pp. 413–430, dgms. 4; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 10, p. 552*).—It is explained that temperatures in the United States are more largely the product of heat transported in the general circulation than of direct solar radiation, and in order to separate circulation from solar radiation the author analyzes data obtained by the Weather Bureau at 50 stations since 1873 on temperature, vapor pressure, and barometric pressure reduced to strictly homogeneous series. He also takes into account "the annual numbers of the solar prominences and the annual amplitudes of the European magnetic field," and studies their synchronism with temperature and vapor and barometric pressures of the United States in 11-year and 3-year periods.

"The synchronism is better defined in the Pacific States than east of the Rocky Mountains, especially in the short period. The amplitudes of the three elements (curves of temperature, barometer, vapor pressure) increase from south to north. In the long-period curves an increase in the prominence and magnetic-force numbers is always accompanied by a decrease in temperature and vapor pressure, but by an increase in the barometric pressure; in the short period the same rule holds for the east, but the reverse for the Pacific States, whose temperatures generally are the reverse of the central and eastern districts in the sense that the monthly residuals have opposite signs. This is explained by the circulation. The Pacific States may practically be considered as part of the tropical system, characterized by a quiescent state of the atmosphere and freedom from cyclonic circulation; part of the Rocky Mountains cyclones and high-pressure areas advance down the slope eastward."

The extension of this system of observation is urged since in the author's opinion "this subject will in the future assume large proportions, because it is the only way at all promising in which to lay the foundations for a system of seasonal forecasting. The Weather Bureau has now adjusted its records to the required standard of observation and computation for about 100 stations, and the future records will continue automatically to unroll the hidden story of the sun's influence upon the earth's weather and climatic conditions."

The moon and the weather, Jochimsen (*Fühling's Landw. Ztg., 57 (1908), No. 14, pp. 502–510*).—Data and arguments are presented to show that the moon does not control the weather to an appreciable extent.

Further notes on the difference of temperature between Mount Royal and the McGill College Observatory.—Local temperature forecasting, C. H. McLeod and H. T. Barnes (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 1 (1907), Sec. III, pp. 3–7, dgms. 2*).—This is a third communication on the subject (E. S. R., 17, p. 224; 18, p. 813), and summarizes further records which confirm the conclusion that the differences in temperature at the mountain top and at the observatory, though small, are of value for local temperature forecasting. Ob-

servations by Church at Reno and on Mount Rose (E. S. R., 18, p. 529) are also referred to as confirming this conclusion.

Indications of approaching frost, R. Strachan (*Quart. Jour. Roy. Met. Soc. [London], 34 (1908), No. 145, pp. 47–50*).—Data are adduced to show that "in the majority of cases the evening dewpoint is no indication of frost unless the sky during the night becomes clear, or a radiation fog is on the ground with a clear sky above it. . . . For the purpose of making forecasts the psychrometer should be noted at or after sunset, or at 9 p. m., and the amount of cloud at the time, and during the fore part of the night if convenient. The dew-point can then be found by Glaisher's Hygrometrical Tables, or roughly by taking the difference between the two thermometers from the reading of the wet-bulb. When the dew-point is at or below 32°, frost is in evidence, but may be evanescent, due to a rise of temperature, with change of wind, rain, or overcast sky. Even when it is above 32°, if the sky is clear it is probable that the temperature on the ground will go low enough for frost to form."

A two years' study of spring frosts at Williamstown, Mass., W. I. Milham (*Mo. Weather Rev., 36 (1908), No. 8, pp. 250–254, fig. 1*).—This article gives reference to recent articles on frost prediction and protection, and summarizes the results of observations at 10 frost stations located in different parts of Williamstown. The following conclusions, which apply not only to Williamstown but probably to the whole of New England, are drawn from the results:

"The so-called spring frosts may be expected from the last of April until the first of June and occur on still, clear nights, with the wind almost invariably from the northwest. They are likely to come on the first or second night following the passage of a low and the transition of the weather control to an area of high pressure. This facilitates both the importation of colder air and radiation, the two processes which cause the low temperatures required. The air is so dry and the dew-point lies so low that it plays no part whatever in determining the amount of the drop from the maximum to the following minimum. The drop is, however, far from a constant, and must be estimated for each individual case, taking into account the probable characteristics of the afternoon and night.

"If, after the probable minimum temperature in the thermometer shelter has been estimated, it is desired to determine what the probable temperature of low-growing vegetation in the coldest part of the limited area will be, three things must be taken into account. First, that plant temperatures go below the real air temperatures, because the plants are in the open without such a hindrance to radiation as is the shelter about a thermometer; second, that vegetation is located near the ground and not at the height of the instruments in the shelter; third, that the variation in temperature over a limited area may amount to several degrees. Were this computation carried out with the average values for Williamstown, about 2° would be allowed for exposure in the open, 3° for height, and 6° for variation between the shelter and the coldest part of the area. Thus the temperature of vegetation in the open, near the ground, in the coldest part of the village may be expected to average 11° lower than the estimated minimum in the shelter as it is now located."

Monthly Weather Review (*Mo. Weather Rev., 36 (1908), Nos. 7, pp. 197–230, figs. 10, charts 6; 8, pp. 231–274, figs. 4, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of July and August, 1908, recent papers bearing on meteorology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 7.—Rain-making in New Zealand; Report upon the Dry Period and Rain-making Experiments at Oamaru, New Zealand (illus.), by D. C. Bates; Inter-

national Exchange Service; Waterspout at Beaufort, N. C., by B. McGlone; and Australian Weather (illus.), by D. J. Mares.

No. 8.—Annual Rise of the Columbia River in 1908 (illus.), by E. A. Beals; The 1907 Annual Rise in the Columbia River; Storms and Ice on the Great Lakes, by N. B. Conger; Studies on the Vortices of the Atmosphere of the Earth (illus.), by F. H. Bigelow; A Two Years' Study of Spring Frosts at Williamstown, Mass. (illus.), by W. I. Milham (see p. 514); Government Meteorological Work in Brazil, by R. DeC. Ward; Further Observations of Halos and Coronas, by M. E. T. Gheury; The Observatory on Mount Etna; The Heaviest Rainfall in One Hour, by A. G. McAdie; and Studies in the Formation of Frost (illus.), by D. A. Seeley.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and R. C. Lindblad (*Massachusetts Sta. Met. Buls. 237, 238, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1908. The data are briefly discussed in general notes on the weather of each month.

[Meteorological observations at North Dakota Station], E. F. Ladd (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 24–33*).—This includes, as in previous years, summaries of temperature and rainfall, monthly record of sunshine, and record of wind velocity. The mean annual temperature of 1907 was 37.26° F., the rainfall 15.34 in.

Annual report of the director of the [Philippine] Weather Bureau for the year 1905, J. Algué (*Ann. Rpt. [Philippine] Weather Bur., 1905, pt. 2, pp. 386*).—A record of meteorological observations at the secondary stations in 1905.

Evaporation from water surface, E. F. Ladd (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 33–36*).—This is a record of a continuation of observations on evaporation from the surface of water contained in a galvanized iron tank, the evaporation during 1907 being compared with that of 5 previous years and with the rainfall during the same period.

Rain and run-off near San Francisco, California, C. E. Grunsky et al. (*Proc. Amer. Soc. Civ. Engin., 34 (1908), Nos. 4, pp. 339–358, pl. 1, figs. 2; 6, pp. 640–660, pl. 1, fig. 1*).—This article discusses the results of a study of the rainfall and run-off of the basins tributary to three storage reservoirs supplying water to San Francisco.

Fluctuations in the level of the ground water and in the flow of springs, C. Mezger (*Gsndhts. Ingen., 31 (1908), No. 32, pp. 501–511, figs. 10*).—The influence of precipitation, atmospheric pressure, temperature, direction of the wind, and other factors upon fluctuations in ground water and flow of springs is quite fully dealt with in this paper.

The removal of iron from potable waters in Germany and the Netherlands, H. Schwers (*Rev. Hyg. et Pol. Sanit., 30 (1908), Nos. 8, pp. 643–673, dgms. 9, map 1; 9, pp. 756–786; 10, pp. 846–878*).—The methods used and their efficiency are discussed at considerable length.

Sterilization of drinking water by chemical agents, H. Labbé (*Rev. Sci. [Paris], 5. ser., 10 (1908), No. 11, p. 343*).—Various processes, particularly those making use of iron and manganese salts, are briefly described.

Sewage and waste waters of industries, P. Razous (*Eaux d'Égout et Eaux Résiduaires Industrielles. Paris, 1908, pp. 192, illus.; rev. in Rev. Sci. [Paris], 5. ser., 10 (1908), No. 7, p. 222*).—This book discusses irrigation and biological processes of purifying sewage, and describes various methods of handling waste water from industrial establishments, such as starch factories, cheese factories, breweries, wine-making establishments, tanneries, dye houses, and abattoirs.

The rôle of the septic tank in the biological purification of sewage water, A. Calmette and E. Rolants (*Rev. Hyg. et Pol. Sanit., 30 (1908), No. 8, pp. 633–643*).—The authors take issue with those investigators who assert that the action of septic tanks is purely mechanical, and report investigations which show that a large amount of decomposition of putrescible substances occurs in the tanks, only the difficultly decomposable materials remaining behind and being precipitated.

Comparison of broad irrigation and intensive biological purification of sewage, Bezault (*Abs. in Rev. Sci. [Paris], 5. ser., 10 (1908), No. 6, pp. 181, 182; Engrais, 23 (1908), No. 39, pp. 926, 927*).—Some objections to the use of irrigation as the sole means of disposal are pointed out.

The agricultural utilization of sewage, Bechmann et al. (*Ann. Sci. Agron., 3. ser., 3 (1908), I. pp. 180–193*).—This is a summary of reports on this subject made to the Eighth International Congress of Agriculture at Vienna in May, 1907. The present status of sewage irrigation in different countries is briefly presented and the advantages and disadvantages of this method of disposal are pointed out. It is shown that under certain conditions sewage irrigation has been successfully used as a means of disposal, but that in many cases it is impracticable on account of the large area of land required. For this reason it has been found in many cases desirable to combine sewage irrigation with other methods of purification.

[Sewage irrigation at Pasadena], W. J. Wright (*Mich. Farmer, 131 (1908), No. 3, p. 43, figs. 2*).—This is a brief account of the use of sewage by the city of Pasadena in the growing of hay, grain, pumpkins, walnuts, and fruit.

The importance of the agricultural utilization of town sewage on the Posen sewage farm to the drain tile and agricultural machinery industry, A. Wulsch (*Gsndhts. Ingen., 31 (1908), No. 35, pp. 549–552, fig. 1*).—Data regarding the cost of installation of the drainage system and of the machinery required on the sewage farm are given.

SOILS—FERTILIZERS.

Soils: Their nature and management, P. McConnell (*London, 1908, pp. XII+104, pl. 1, figs. 10; rev. in Nature [London], 78 (1908), No. 2016, p. 150*).—This is a short practical treatise for the use of the British farmer and gardener. It discusses from the practical man's standpoint the origin, composition, classification, distribution, physical properties, improvement, tillage, and management of the soils of Great Britain. The book also discusses the physical geography of the farm and gives suggestions regarding the selection of farms.

On transported soils with especial reference to the Roman Campagna, G. de Angelis d'Ossat (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908); I, No. 7, pp. 439–448, figs. 5*).—The author shows by means of diagrams how transported soils increase in complexity from the head of a valley downward according to the various strata cut through and formulates the following law: The agricultural value of a transported soil is equal to the algebraic sum of the elements of each generating rock, taking account, however, of the transformations undergone.

Results of tests of soil samples taken in the valley of the Teverone River are given which show a high percentage of carbonate of lime. This accounts in part for the fact that the chief characteristic of the transported soil of the Tiber Valley is carbonate of lime.

Study of Belgian soils (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 5, pp. 543, 544*).—The results of analyses of 47 typical soils and subsoils of Belgium are briefly discussed in this article, attention being called especially to the deficiencies and fertilizer requirements of the different soils.

Nature of the soils of Morocco (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], 7 (*1908*), *No. 5, pp. 564–566*).—The soils of Fez are briefly considered in this article. They are grouped as cultivated soils and pasture soils, there being several subdivisions of each group. Chemical analyses of typical samples of red and black clay and sandy soils are reported.

Report of Adzhibay Experiment Field for 1904 to 1906, D. P. Shushak (*Adzhibaĭskoe Opuitnoe Pole. Otchet za 1904, 1905, i 1906. Simpheropol, Russia, 1907, pp. 91; rev. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 6, pp. 709–711*).—Observations on the influence of fallow, fertilizers, and cultivation on the physical, chemical, and biological properties and processes of the soil are recorded in this report.

On the rate of some phenomena of weathering, P. Zemyatchenskiĭ (*Trav. Soc. Imp. Nat. St. Petersb., Sect. Géol. et Min., 34* (*1906*), *No. 5, pp. 181–190; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 6, p. 707*).—The author observed that in certain ruins in Austria there has formed from limestone during 500 to 600 years a soil layer 10 cm. thick with 4.4 per cent of humus, while on the adjoining natural deposits of limestone the soil layer has a thickness of 38 to 40 cm. with 7.7 per cent of humus. On the basis of the rate of the formation of the soil on the ruins, 2,400 years should have been required for the formation of the 38 to 40 cm. soil layer. On a fortress wall of limestone in the Crimea, which has been exposed to weathering during 600 years, a soil layer 10 cm. thick has formed. The adjoining lands have a soil layer 65 cm. in thickness which should have accordingly required 3,600 years for its formation.

Some laboratory experiments on the capillarity of soils, N. Tulaykov (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 6, pp. 629–666, figs. 3*).—The experiments were made with soils from the Muganj steppe, with the object of clearing up some details of the process by which the soils of that region are turned into alkali lands. See also a previous note (E. S. R., 18, p. 818).

The capillary rise of water was studied in sandy soil from 7 different depths and a clay loam from 5 different depths, the samples of soil after passing a sieve with 2 mm. mesh being carefully packed in glass tubes 3 cm. in diameter and 150 cm. long. In the case of a coarse-grained sandy soil the capillary rise was rapid at first—55 cm. during the first 24 hours. The water had reached a height of 135 cm. in 513 days and was still slowly rising. In a fine-grained clay soil the water rose 52 cm. in the first 126 days and apparently became stationary at 65 cm. after 1½ years. In other soils of this kind, however, the rise was considerably higher and did not become stationary after 1½ years.

In different layers of a sample of clay soil the height of rise of water during the first 30 days was inversely proportional to the content of particles less than 0.005 mm. in diameter. The velocity of rise in the early stages was greater the larger the soil particles, but it decreased in the course of time more rapidly in coarse-grained than in fine-grained soils. Where the layers of soil were arranged in the tubes in the order in which they occurred in nature the rise of water seemed to depend entirely upon the capillary capacity of the lowest layer immediately in contact with the water supply.

An experiment was begun on February 15, 1906, to study the relation of capillary rise of water to movement of alkali salts. On November 28 the water had risen to a height of 150 cm. and on January 4, 1907, needle-shaped white crystals of salts were observed on the surface of the soil. On March 4 the tube was cut into sections of 10 cm. in length and the salt content of each section determined. The data thus obtained showed a gradual and more or less complete transport of the salts from the lower to the upper layers. Thus the first upper section

contained before the experiment 0.59 per cent of salts, and after the experiment 6.61 per cent, while the lowest three sections, the salt content of which was originally 1.95 per cent, retained at the end of the experiment, respectively, 0.09, 0.06, and 0.33 per cent. The surface of the soil in the tube presented the typical appearance of alkali land.

An examination of the water content in the different sections of the soil after the water had risen to the surface showed that only near the source of the water supply was the soil completely saturated, while the upper layers contained only about one-half of their full capacity.

On comparing the rate of the movement of the water in a vertical and in a horizontal tube it was found that the same distance was covered in a horizontal tube in an hour as would take a month in a vertical tube.

Effect of carbon bisulphid on soils and plants, M. A. Egorov (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *9 (1908), No. 1, pp. 34–95; abs. in Jour. Chem. Soc.* [*London*], *94 (1908), No. 547, II, p. 421*).—The author's experiments show that the capacity of the soil for moisture is reduced by treatment with carbon bisulphid and that the particles of the treated soil are less easily moistened than those of untreated soil. In vegetation experiments, however, treatment with carbon bisulphid increased the yield of oats. On examining the soil after removing the crops it was found that carbon bisulphid still remained in all pots to which it had been applied, proving that the entire growth of the plants had been made in the presence of carbon bisulphid.

The favorable influence of the bisulphid is usually accounted for by its action on the nitrogen of the soil, but the author could not discover an increase of the nitrogen content of either the soil or the crop produced. An increase of the nitrogen content of the soil took place only after the removal of the carbon bisulphid. In the opinion of the author the effect of carbon bisulphid consists in stimulating the growth of the plants, and he reports experiments which showed that etiolated germs of Jerusalem artichoke and pumpkin grew better in solutions of 0.03 to 0.06 cc. of carbon bisulphid or ether per liter of water than in pure water.

Investigations on nitrification, L. C. Coleman (*Centbl. Bakt.* [*etc.*], *2. Abt., 20 (1908), Nos. 12–14, pp. 401–420; 15–17, pp. 484–513; abs. in Jour. Chem. Soc.* [*London*], *94 (1908), No. 546, II, p. 315; Chem. Ztg., 32 (1908), No. 31, Repert., p. 206; Chem. Zentbl., 1908, I, No. 14, p. 1415*).—Investigations are reported on the influence of dextrose and other substances on nitrification in the soil; the influence of moisture on nitrification and denitrification and on the action of dextrose in the soil; on pure cultures of nitrate organisms and the influence of dextrose on the activity of such organisms; experiments with nitrite organisms; the carbonaceous food of nitrate organisms and the assimilation of carbon by such organisms; and the influence of carbon bisulphid on nitrification in soils.

It was found in these investigations that nitrification was considerably increased in nonsterilized soils by the addition of small amounts (0.5 per cent) of dextrose, the greatest increase being observed in the second and third weeks. Subsequently the effect decreased and denitrification due to organic matter increased.

Cane sugar, glycerin, and lactose in small amounts seemed to have a favorable effect on nitrification. Calcium butyrate seemed to have no effect, while calcium acetate apparently retarded nitrification. Peptone and urea (0.5 and 0.75 per cent, respectively) greatly retarded nitrification.

Nitrification was most active in loam soil with a moisture content of 16 per cent. It was greatly retarded when the water content was reduced to 10 per cent or increased to 26 per cent. With the higher percentage of water the addition of dextrose was injurious rather than beneficial.

The activity of nearly pure cultures of nitrate and nitrite organisms in sterilized sand or soil was increased by the addition of 0.02 and 0.05 per cent of dextrose. Under similar conditions the activity of pure cultures of the nitrate organism was increased by the addition of 0.05 per cent of dextrose. A supply of carbon dioxid is necessary for both the nitrate and the nitrite organisms whether dextrose is added or not. Carbon bisulphid retarded nitrification at first, but afterwards increased it, probably as a result of stimulating action.

Course of nitrification under the conditions of field experiments, S. Frankfurt and A. Duschechkin (*Vyestnik Sakh. Promuish., 1907; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *8* (*1907*), *No. 6, pp. 707, 708*).—Determinations of nitric acid and ammonia in the soils of fields of the Russian Society of Sugar Manufacturers, which have been under experiment during a number of years, are reported, the object being to ascertain the influence of barnyard and green manures on the course of nitrification. During the years 1903 to 1906 determinations were also made of nitrate and ammonia nitrogen in soil planted to beets and in unplanted soil.

Some of the main results were as follows: An increased nitrification was observed only on those fields on which the manure raised the yield. Large quantities of straw manure did not lower the content of nitrate nitrogen in the soil. Green manures lowered the content of nitrate and ammonia nitrogen in the soil, and in this respect there seemed to be no difference between leguminous and nonleguminous plants. The effect of the green manure is attributed to changed moisture conditions resulting from the cultivation of green-manuring plants.

Periodic observations on the content of nitrate and ammonia nitrogen in the soil showed these to be very variable, but no close connection between the variations of the nitrate and ammonia nitrogen in the soil was observed. The soil not occupied by beets always showed a higher nitrate content than soil planted to beets. This difference is accounted for not only by the consumption by the plants of the nitrates of the soil but chiefly by the greater humidity of the soil not occupied by the plants.

The effect of carbonates upon nitrification, W. L. Owen (*Georgia Sta. Bul. 81, pp. 42, pls. 4, figs. 4*).—This bulletin discusses the importance and advantages of nitrification in relation to plant growth. In view of the importance of nitrification (1) in supplying the plant with highly available nitrogen, and (2) in preventing the loss of nitrogen from decomposing organic matter, the author undertook investigations having as their object the discovery of the best means of stimulating the activity of the nitrifying organisms.

The investigations here reported dealt with "the extent to which nitrification depends on the supply of carbonates present, and what forms of carbonates are most conducive to nitrification." In order to determine these points series of experiments were undertaken on (1) the effect of increasing amounts of carbonates on the nitrification of a given amount of ammonia; (2) the relative values of potassium, magnesium, and calcium carbonate in their effect on nitrification; and (3) the nitrification of an equal amount of ammonia in (a) ordinary culture flasks, (b) special flasks so constructed as to admit of air deprived of its carbon dioxid content, and (c) flasks to which carbon dioxid is supplied in excess.

"Pure cultures of the Nitrosomonas and Nitrobacter were obtained by inoculating with 3 gm. of garden soil a medium of the following composition: Ammonium sulphate 1 gm., potassium phosphate 1 gm., magnesium carbonate 5 gm., distilled water 1,000 cc. This medium was sterilized by the intermittent method for 15 minutes on each of three consecutive days. The flask containing the inoculated medium was placed in an incubator and kept for several days at a

temperature of 37.5° C., at the end of which time microscopical examinations were made in order to determine whether the nitrifiers were present. In most cases there was little difficulty in obtaining pure cultures by this method, for the media used being entirely inorganic there was but little danger of contamination. But in order to be assured of the purity of the stock cultures used in the experiments, an inorganic solid medium was prepared by thoroughly washing agar-agar until the impurities and organic matter were dissolved, and then adding the inorganic salts used in the liquid stock cultures. The medium was prepared by adding 15 gm. of agar-agar to a liter of distilled water, dissolving it by heating over a radial stove, and then distributing equally among 4 large flasks. To each of these flasks was added distilled water in sufficient quantities to fill them, and this supply was renewed daily for 2 weeks. At the end of that time the agar had been thoroughly washed, and its organic matter largely lost in the process. The 4 flasks were then placed in an Arnold steam sterilizer and the agar having been thoroughly dissolved, the inorganic salts were added in the proportions used in the preparation of the liquid media for stock cultures.

"The medium thus made was then sterilized in an Arnold sterilizer in the usual manner, after which it was inoculated from the liquid culture and plated out in petri dishes. The colonies that developed on this medium were soon identified by means of microscopical examinations, as being Nitrosomonas and Nitrobacter, and transfers were then made to a flask containing liquid media of the same composition as that from which the agar was inoculated.

"The stock cultures thus prepared proved very satisfactory, and this method of isolating the organisms was used almost entirely in the investigation. The use of washed agar gave much better results than that of Winogradski's silicic acid medium, since the colonies developed more rapidly upon the former, and the agar having a smoother surface, the bacterial development was more clearly defined, and therefore more easily detected."

Culture media in which the supply of carbon in inorganic form (magnesium carbonate, calcium carbonate, potassium carbonate, and free carbon dioxid) varied were inoculated with these organisms and the rate of formation of nitrites and nitrates noted.

A special flask designed by the author for the investigations which required the elimination of the carbon dioxid of the air is described.

The author concludes from the results obtained that nitrification is affected by carbonates and that magnesium carbonate is more efficient than the other carbonates tested in promoting the growth of nitrifying organisms. He also concludes that "the nitrifying organisms of the soil do not depend to any appreciable extent on the carbon dioxid of the air for their carbon supply."

On the present state of knowledge of micro-organisms which fix free nitrogen, L. Palmans (*Ann. Gembloux, 18 (1908), No. 5, pp. 289–309*).—This is a review with a bibliography of 60 references to literature of investigations on the subject.

Utilization of the nitrogen of the air by plants, T. Jamieson (*Ann. Sci. Agron., 3. ser., 2 (1907), I, pp. 1–46*).—This is a reprint in French of a revision of the original paper on this subject (E. S. R., 19, p. 127).

Nitrogen fixation for nonleguminous plants, W. B. Bottomley (*Country Life [London], 23 (1908), No. 598, pp. 899, 900, figs. 5*).—This article briefly discusses the possibility of aiding the growth of nonleguminous plants by inoculation of the soil with nitrogen assimilating organisms, and refers to recent experiments by the author with oats, barley, cabbage, turnips, radishes, beets, strawberries, etc., which it is claimed have given promising results.

Do roots assimilate nitrates? P. Slezkin (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 1, pp. 27–33, figs. 4*).—The author conducted vegetation experiments in vessels divided into 4 sections, each containing a different nutritive solution, thus making it possible to transfer the roots of a plant at different stages of growth from one solution to another. In one case a long root from a nitrate solution was so bent that it was partly immersed in the nitrate solution and partly in a solution containing calcium phosphate. In the latter solution new shoots soon appeared, while the part of the root in the nitrate solution remained smooth as before. On the other hand, a root from a solution containing calcium phosphate partly bent over into a nitrate solution continued to strongly develop in the former, new shoots appearing and old secondary roots growing considerably, while the part in the nitrate solution did not increase in length and formed only rudimentary shoots. The conclusion is drawn from these experiments that if the growth of the roots is an indication of independent assimilation, roots assimilate only phosphoric acid and do not assimilate nitrates.

Note on a toxic substance excreted by the roots of plants, F. Fletcher (*Mem. Dept. Agr. India, Bot. Ser., 2 (1908), No. 3, pp. 16, pl. 1; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 549, II, p. 617*).—From observations on cotton, sorghum, cajanus, and sesame grown side by side in field plats and on the same crops, and wheat and gram, grown in water cultures, the conclusion is reached that plant roots excrete a substance which is injurious to other crops. This seems to be especially pronounced in case of sorghum. The results both in the field and in water cultures indicate that the substances excreted by various plants are identical. Chemical tests of the substances obtained in water cultures indicate that they are alkaloidal in character.

"The amount of substance given out by the roots is not inconsiderable. For instance, the precipitate obtained by adding potassium sulphate to a solution containing the excrement of 10 cotton plants growing until their combined air-dry weight was 0.4 gm. weighed, when dry, 0.21 gm.

"Sesamum in its early stages of growth appears actually to excrete a greater amount of material than it builds up in its own substance." See also a previous note (E. S. R., 19, p. 822).

An alleged excretion of toxic substances by plant roots (*Nature [London], 78 (1908), No. 2026, pp. 402, 403*).—Reviewing recent investigations on this subject, including especially those of the Bureau of Soils of this Department and of F. Fletcher, the conclusion is reached that "we can not consider that the question of root excretion has been materially advanced in any of these publications."

The productiveness of the soil: Biological factors, J. Massart (*Ann. Gembloux, 18 (1908), No. 6, pp. 347–353, pls. 6*).—This is a review of work of the Bureau of Soils of this Department on the relation of toxicity to fertility of soils. For another article of this series see a previous note (E. S. R., 19, p. 1015).

Further soil tests in paraffined wire baskets, B. L. Hartwell and F. R. Pember (*Rhode Island Sta. Bul. 131, pp. 15–31*).—This bulletin contains an account of a continuation of work previously reported in Bulletins 120 and 121 of the station (E. S. R., 19, p. 317), "and concludes the comparison of the results of soil tests in the field with those secured by the 'wire-basket method for determining the manurial requirements of soils,'" which were made in cooperation with the Bureau of Soils of this Department.

"Results by the basket method, with soils from eight different localities in the State during two seasons, are presented. In certain cases, first and second trials have been made with the same soil during the same season.

"The frequent failure of the method to secure at different times similar indications regarding the deficiencies of a given soil, even when carried out in the same manner, is the most discouraging feature concerning the usefulness of the method.

"The many instances of disagreement between the results by the basket method and those secured in actual field practice render unreliable the indications which the method in its present form affords regarding the manurial requirements, at least of certain soils.

"The addition of muriate of potash resulted in a retardation of the transpiration as compared with its effect on the green weight of the tops. The average difference in the percentage change according to the two criteria of growth was equal to 10 per cent, an amount of sufficient importance to make it seem desirable in work of this kind to adopt the weight of the green crop rather than the transpiration as a measure of the manurial effect of such salts, owing to their tendency to retard transpiration."

Notes on humus and the best means of supplying it, F. B. Guthrie (*Agr. Gaz. N. S. Wales, 19 (1908), No. 3, pp. 200–205*).—This article discusses briefly the functions of humus and the methods of supplying it through barnyard manure, compost, and green manures. It also includes the results of some experiments in which the amount of material and proportion of nitrogen supplied to the soil in green-manuring crops of vetches (roots and tops) were determined.

Technique of fertilizers, J. Dumont (*La Technique des Engrais. Paris, 1908, pp. 432; rev. in Chron. Agr. Vaud, 21 (1908), No. 12, pp. 297, 298*).—This is an extension and revision of the author's treatise on the Rational Use of Fertilizers, published several years ago (E. S. R., 5, p. 1098), and deals especially with specific conditions under which fertilizers may be used with advantage, although the general theories of fertilization are also discussed.

Analyses of commercial fertilizers, B. L. Hartwell et al. (*Rhode Island Sta. Bul. 130, pp. 11*).—"This bulletin contains the analyses of such potato and vegetable fertilizers as were found on sale in Rhode Island during the spring of 1908, as well as certain other brands carrying guaranties similar to those usually accompanying potato fertilizers. The analyses of the samples of ground bones which were collected in 1908 are likewise included."

Fertilizer experiments (*Dept. Landb., Nijv. en Handel, Verslag. en Meded. Dir. Landb. [Netherlands], 1908, No. 1, pp. 1–26*).—Experiments with barnyard manure, lime, nitrate of soda, sulphate of ammonia, lime nitrogen, guano, superphosphate, potash salts, and other materials are reported.

On the nitrification of certain nitrogenous fertilizers, S. de Grazia (*Rend. Soc. Chim. Roma, 6 (1908), No. 2, pp. 40, 41*).—In a series of experiments on the rate of nitrification of sulphate of ammonia, calcium cyanamid, and dicyandiamid on sandy, clay, humus, and calcareous soils it was observed that on all soils nitrification was very slow or did not occur at all except in the case of sulphate of ammonia. Denitrification occurred at first and nitrification had hardly begun at the end of 4 months. In case of the dicyandiamid almost no nitrification occurred.

The physiological action and the fertilizing value of salts of dicyandiamid, R. Perotti (*Rend. Soc. Chim. Roma, 6 (1908), No. 7, pp. 124, 125*).—Soil organisms grew normally and seeds of wheat, corn, clover, and mustard developed normally in nutritive solutions containing 0.25 per cent of the sulphate or chlorid of dicyandiamid. Injurious effects were observed when the proportion was increased to 1 per cent. In pot experiments with normal soil sprinkling with 1 per cent solutions at the rate of 4 to 5 quintals per hectare (about 350 to 450 lbs. per acre) was not injurious, and there was no evidence of nitrogen hunger. There was no evidence that the dicyandiamid was very

corrosive as asserted by Frank. The author believes that such corrosive action as is observed should be ascribed to the cyanamid, for in normal soils of alkaline reaction dicyandiamid or even its sulphate can have but a brief existence in the soil, being rapidly changed to ammonia.

The properties of calcium cyanamid in relation to water, air, and bacteria, L. Grandeau (*Jour. Agr. Prat., n. ser., 15 (1908), No. 21, pp. 645, 646*).—This is a brief summary of the main conclusions from investigations by Wagner (E. S. R., 19, p. 627) on this subject.

Recent work on calcium cyanamid and its fertilizing value, L. Grandeau (*Jour. Agr. Prat., n. ser., 15 (1908), No. 20, pp. 613, 614*).—This is a brief summary of the main conclusions drawn from recent work by Immendorff and Wagner (E. S. R., 19, pp. 424, 627), relating especially to the chemical and biological changes which occur in calcium cyanamid in the soil.

Transformation of the nitrogen of calcium cyanamid in cultivated soils, L. Grandeau (*Jour. Agr. Prat., n. ser., 15 (1908), No. 23, pp. 709–711*).—This is a brief review, mainly of work by Wagner (E. S. R., 19, p. 627) on the rate of transformation in the soil of the nitrogen of cyanamid into ammonia and nitric acid, showing that the rate of such transformation is to a large extent dependent upon the character of the soil.

Investigations on the gaseous products of decomposition of lime nitrogen and their effect on plant growth, E. Haselhoff (*Landw. Vers. Stat., 68 (1908), No. 3–4, pp. 189–228; abs. in Chem. Ztg., 32 (1908), No. 48, Repert., p. 311; Chem. Zentbl., 1908, I, No. 26, p. 2199; Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 728*).—It is shown that in the decomposition of lime nitrogen in water, ammonia, acetylene, hydrogen phosphid, and hydrogen sulphid are formed. It was found that these gases exert an injurious effect on germination, and this effect is to be attributed primarily to free ammonia and hydrogen phosphid. The results of pot experiments and water cultures showed the injurious effect of these gases on growing plants, and in the water cultures hydrogen sulphid was also found to be decidedly injurious. Injurious effects of acetylene were not observed.

Fertilizer experiments with lime nitrogen on winter grain and sugar beets, A. von Liebenberg (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 3, pp. 153–180*).—The lime nitrogen was less effective than nitrate of soda and sulphate of ammonia on the grain, apparently being slower in action. With sugar beets the results reported are inconclusive.

Experiments in 1907 with nitrate of lime in comparison with nitrate of soda, R. de Limay (*Bul. Soc. Agr. France, n. ser., 40 (1908), May 1, Sup., pp. 286–289*).—Experiments with oats and barley are briefly noted, in which the effect of the two nitrates was practically the same.

Cold, the checking of growth, and the use of nitrates, L. Grandeau (*Jour. Agr. Prat., n. ser., 15 (1908), No. 18, pp. 549, 550*).—Attention is called to the beneficial effect of applications of nitrate of soda in overcoming injury by cold in case of cereals, potatoes, beets, asparagus, and other vegetables.

The manufacture of nitrates, E. Bazin (*Bul. Soc. Agr. France, n. ser., 40 (1908), May 1, Sup., pp. 323–328, figs. 2*).—The construction of a peat niter bed on the principle described by Müntz and Lainé (E. S. R., 18, p. 430) is described.

Atmospheric nitrogen as a future commercial source of plant food, L. L. Van Slyke (*West. N. Y. Hort. Soc. Proc., 53 (1908), pp. 100–108*).—This is a summary of information regarding the commercial sources of inorganic nitrogen compounds used in agriculture; different methods of utilizing atmospheric nitrogen, including methods of preparing and using nitrogen compounds derived

from this source; and a discussion of future possibilities in commercial production of nitrogenous plant food.

Experiments with feldspathic rock as a source of potassium, B. L. Hartwell and F. R. Pember (*Rhode Island Sta. Bul. 129, pp. 197–206, pl. 1*).—This bulletin refers to experiments by this Department on finely ground feldspathic rocks as a source of potash for plants and reports water cultures with wheat seedlings in which varying amounts of fine ground feldspar were used alone or in combination with potassium chlorid and ground quartz, together with pot experiments with wheat in which fine ground feldspar and sulphate of potash were compared in varying amounts.

It was found in the water cultures that the addition of feldspar and of quartz to 32 parts per million of potassium in form of potassium chlorid increased the green weight of plants, the quartz being practically as efficient in this respect as feldspar. There was no evidence that this increase was due to the potash of the feldspar.

In the pot experiments feldspar was apparently unable to supply the deficiency of potash in a soil very poor in this element. "The maximum increase with the feldspar was only 18 per cent, whereas the maximum application of sulphate of potash increased the yield about one and one-half times, or 148 per cent.

"An average of the results from the three different applications reveals the fact that, even though 5.5 times as much ground feldspar as sulphate of potash was used, in order to supply an equal amount of potassium, the yield was increased ten times as much with the sulphate of potash as with the feldspar. From the standpoint of crop production, then, the sulphate of potash was in this case 55 times more valuable than an equal amount of ground feldspar."

Investigations on the formation of oceanic salt deposits, J. H. Van't Hoff (*Sitzber. K. Preuss. Akad. Wiss., 1908, No. 22, pp. 436–439*).—This is the conclusion of this series of contributions, and explains a cooperative plan for scientific study of the German potash deposits.

Contribution to the knowledge of the natural factors involved in the solution of tricalcium phosphate in the soil, R. Perotti (*Atti R. Accad. Lincei. Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), I, No. 7, pp. 448–451, fig. 1; Rend. Soc. Chim. Roma, 6 (1908), No. 4, pp. 64, 65; abs. in Chem. Zentbl., 1908, I, No. 22, p. 1945; Jour. Chem. Soc. [London], 94 (1908), No. 548, II, p. 527; Jour. Soc. Chem. Indus., 27 (1908), No. 13, p. 696*).—From experiments with different soil organisms in culture media using various sources of nitrogen—ammonium tartrate and sulphate, potassium nitrate, urea, and asparagin—the author concludes that in media containing physiologically acid salts, as, for example, ammonium sulphate, there is a uniformly important solution of tricalcium phosphate, while this action is insignificant in media containing physiologically alkaline salts, such as sodium nitrate.

Tests of the use of gypsum as a fertilizer, C. Dusserre (*Ann. Agr. Suisse, 9 (1908), No. 1, pp. 7–9*).—Tests of the effect of gypsum on the yield of potatoes, beets, oats, and wheat are reported, showing that in case of potatoes and beets the application of gypsum greatly increased the yield. In case of potatoes the mineral matter and starch were also considerably increased by the use of gypsum. In case of sugar beets the proportion of lime and potash in the ash was slightly increased on the gypsum plats.

In laboratory experiments it was found that the mixture of gypsum with soil resulted in a considerable increase in the amount of potash extracted by pure water. If the amount of potash extracted by pure water from untreated soil be taken as 100, that extracted from soil containing gypsum was 127, from

soil containing Thomas slag 104, and from soil containing calcium superphosphate 492.

Mineral resources of the United States, calendar year 1906, D. T. Day et. al. (*U. S. Geol. Survey, 1907, pp. 1307, figs. 2*).—This is the usual detailed report on this subject. The chapter of greatest agricultural interest is that relating to phosphates, a preliminary summary of which has already been noted (E. S. R., 19, p. 422).

Regarding the future of the guano industry and the guano-producing birds of Peru, R. E. Coker (*Bol. Min. Fomento [Peru], Dir. Fomento, 6 (1908), No. 4, pp. 25–34; Science, n. ser., 28 (1908), No. 706, pp. 58–64; Amer. Fert., 29 (1908), Nos. 4, pp. 10–12; 5, pp. 20–22, fig. 1*).—This paper is substantially a reprint of a report recently submitted to the Peruvian Government. It describes briefly the past exploitation and present status of this industry and suggests methods by which it may be saved from entire destruction. It is explained that the present system of exploitation results in the continual disturbance and gradual extermination of the birds which produce the guano. It is believed that this may be corrected to some extent by placing the extraction of guano in the hands of a single company, and providing for a rotation in the working of the deposits and a closed season with increased protection for the birds.

Production and extraction of guano, R. E. Coker (*Mem. Dir. Fomento [Peru], 1907–8, vols. 1, pp. XCIII, XCIV, pl. 1; 2, pp. 5–30, pls. 6*).—This is the full text of the report referred to in the above abstract.

Utilization of wrack, A. Swalm (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3171, pp. 6, 7*).—A brief note regarding the use of seaweed as a fertilizer and for the manufacture of iodin on the Island of Jersey and the south coast of England.

City household garbage, L. Danger (*Illus. Landw. Ztg., 28 (1908), No. 37, pp. 327, 328*).—The composition, fertilizing value, and methods of using this material are discussed. Raw garbage is considered of little value or even may be positively injurious as a fertilizer. When treated, as is done in the garbage works of Altona, near Hamburg, by careful sorting, the fine garbage has considerable fertilizing value, comparing favorably with barnyard manure.

Utilization of household wastes, Bocher (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 3, pp. 147–163*).—Incineration, grinding, and other methods of handling garbage are discussed and methods employed by various municipalities are briefly described. Incineration is condemned. Grinding as practiced at the Vitry factory is recommended because of the value of the products obtained, viz, from 100 tons of raw garbage 80 to 85 tons of inodorous fertilizer equal in value to farmyard manure and 15 to 20 tons of waste valuable as fuel.

Apparatus and transportation appliances for utilizing and handling dead animals and slaughterhouse refuse, Fränkel et al. (*Arb. Deut. Landw. Gesell., 1908, No. 139, pp. 159, figs. 35*).—This article deals in detail with the mechanical construction and operation of the apparatus and appliances, the handling of the liquid wastes, value of the products, and adaptability and selection of the apparatus. An appendix gives the police regulations adopted in connection with the Dieburg establishment.

AGRICULTURAL BOTANY.

The physiology of stomata, F. E. Lloyd (*Carnegie Inst. Washington Pub. 82, pp. 142, pls. 14, figs. 40*).—A study was made of 2 types of desert plants (*Fouquieria splendens* and *Verbena ciliata*) to determine some facts relating to the physiology of stomata. Neither of these plants has any special stomatal

modifications to regulate transpiration. The investigations were carried on to determine the alleged regulation of water loss by the stomata and the physiological causes of stomatal movement.

On the theory of stomatal regulation of water loss, a close correlation would be expected between the daily periodicities of transpiration and of stomatal movement. The rate of transpiration, however, was found to increase for a considerable period after the maximum stomatal opening had been reached. The diminution in the rate of transpiration during the latter part of the day may be interrupted by intervals of increase without any interruption in the diminution of stomatal dimensions. Such conclusions throw doubt on the accuracy of the view of stomatal regulation as suggested above.

It was found that the rate of transpiration may undergo sudden and wide changes without the accompaniment of a sufficient change in the dimensions of the stomata to account for them on this theory. It appears that stomatal regulation of transpiration does not occur, although conservation of the contained water follows the complete closure of the stomata.

Observations on the changes in the rate of transpiration during constant conditions of temperature and relative humidity, and in total darkness, brought out the fact that there exists in Fouquieria an induced rhythm in transpiration, the cause for which is quite obscure.

During the process of wilting there was found to ensue a gradual closure of the stomata without any preliminary opening such as is claimed to occur by Francis Darwin. The beginning of closure occurs somewhat later than initial wilting and seems to be a result of water loss by the leaf as a whole.

In studying the physiology of guard cells, the author found in the Verbena a fluctuation of the amount of starch within the plastids of the guard cells, accompanied by a complementary fluctuation of the oil content. The presence of the oil and the conditions of its formation indicate that it is of secondary importance. The starch content was found to be at its minimum during the later hours of the morning. During the earlier hours of the morning the starch is dissolved and disappears from the plastids of the guard cells, to reappear and increase to the maximum toward the afternoon and earlier part of the night. The movements and periods of stasis of the stomata are closely correlated with this appearance and disappearance of starch. The author states that it would appear that the plastids of the stoma, which present certain morphological differences needing further investigation, normally accumulate starch when exposed to the blue end of the spectrum, to darkness, and to air devoid of carbon dioxid. This is contrary to the conditions under which starch is ordinarily formed in the chlorenchyma. Beginning with an initial condition of the entire absence of starch, this substance was found to be formed and to materially increase when photosynthesis was impossible. It seems that the guard-cell plastids are not only able to accumulate starch in the dark without a supply of carbon dioxid, but normally do so by drawing upon the general supply of the leaf. The disappearance of starch from the guard cells in the early morning, and its persistence in darkness, especially in plants in which a supply of food materials is available, compels the assumption of a mechanism of digestion of a different kind from the ordinary diastase of the leaf, and while such an agent has not been demonstrated, its probable occurrence has been reported. It is believed that a clear understanding of this assumed ferment will account for the movements of stomata which have remained unexplained by the generally prevalent photosynthetic theory.

The relation of stomatal activity to normal, though high, temperatures and to the very low humidities of the desert appears to be the same as to these conditions anywhere, and there seems to be no adaptive behavior particularly

suited to the supposedly trying climate to which the plants studied by the author are subject. As long as a water supply is available and the plant is kept cool by transpiration, it suffers no more in the Tropics than in temperate regions. There does not seem to be any evidence that the behavior of the stomata tends to mollify the rigor of the environment.

A bibliography of the subject is given.

The influence of a mixture of soluble salts, principally sodium chlorid, upon the leaf structure and transpiration of wheat, oats, and barley, L. L. HARTER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 134, pp. 22*).—The investigation reported was undertaken with a view of ascertaining whether the presence of a mixture of soluble salts, consisting chiefly of sodium chlorid, such as occurs in excessive quantities in many alkali soils, will affect the structure of plants not especially adapted to such soils, and if modifications of structure take place whether they resemble those which characterize plants growing naturally in saline soils.

It was possible to demonstrate that culture in a soil containing considerable quantities of sodium chlorid together with other salts produces measurable changes in the leaf structure of wheat, oats, and barley. The most notable modification produced was the conspicuous bloom or waxy deposit that formed on the surface of the leaves. This development of bloom was accompanied by an easily measured increase in the thickness of the cuticle and outer walls of the epidermal cells and by a marked decrease in their size.

In regard to transpiration of the plants, it was found that when the alkali salts are present in sufficient concentration to cause the modifications of structure noted, transpiration is considerably reduced. On the other hand, the same salts when present in amounts too small to produce any measurable influence upon structure have a decidedly stimulating effect upon transpiration.

The value of sodium to plants by reason of its protective action, W. J. V. OSTERHOUT (*Univ. Cal. Pubs., Bot., 3 (1908), No. 3, pp. 331–337*).—According to the author, the idea that sodium is valueless to plants is based on the nutritive function of mineral salts and does not take into consideration their protective function. In previous publications (E. S. R., 19, pp. 727, 933), the author has confirmed Loeb's conception regarding balanced solutions when applied to plants.

Experiments with sodium *v.* potassium, ammonium, magnesium, and calcium in water cultures and in sand showed with a large number of plants a protective influence against the injury resulting from growing plants in cultures to which a single salt solution was added.

It seems clear that sodium has no nutritive function in plants, but only a protective action, and this seems to be also the case for animals. It appears probable that sodium may render the plant a useful service as a protective agent, and in the case of certain plants it appears to be indispensable.

The protective effect of sodium on plants, W. J. V. OSTERHOUT (*Jahrb. Wiss. Bot. [Pringsheim], 46 (1908), No. 2, pp. 121–136, figs. 3*).—This is a detailed account of the experiments noted above.

Notes on hydrocyanic acid in some plants, A. W. K. DE JONG (*Ann. Jard. Bot. Buitenzorg, 2. ser., 7 (1908), pt. 1, pp. 1–17, fig. 1*).—The author has made an investigation of the hydrocyanic acid contained in *Pangium edule*, and finds that the glucosid occurring in the leaves of that plant is identical with gynocardine, a glucosid occurring on the seeds of *Gynocardia odorata*.

A study was made of the presence of free hydrocyanic acid in the leaves of Pangium, and the author found that it is formed in greater or less quantity.

Sugar is also present in considerable amount, but aldehyde or ketone, while present, exists in relatively small amounts.

The author investigated the occurrence of phaseolunatin in the leaves of *Phaseolus lunatus* and found that this substance, which has been reported by Dunstan et al. (E. S. R., 19, p. 129) in the seed of the Java bean, also occurs in considerable quantity in the leaves of that plant.

A study of yeasts from California grapes, H. C. HOLM (*California Sta. Bul. 197, pp. 169–175*).—A study was made of 8 varieties of yeasts obtained originally from California grapes which were either sent to the experiment station or purchased in the local market. The experiments were carried on with the intention of determining the amount of alcohol which the various yeasts were able to form in sugar solutions, and whether the yeasts occurring on California grapes consisted of types which might be depended upon in wine making.

The yeasts were all used in pure cultures. The results show that most of the yeasts found on California grapes grown in regions remote from wine-making operations are inactive as regards the formation of alcohol, and many of them are detrimental to the wines. Most of the varieties impart an unpleasant flavor and taste, and the general characteristics do not favor the production of a sound wine of good quality. The author recommends the repression of the growth of these organisms and the introduction and application of pure yeast in California wineries.

[Report of the] department of botany, H. L. BOLLEY (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 45–76*).—An outline report is given of the work carried on by the department of botany of the station during 1907 and of the different lines of investigation. Notes on the North Dakota fungi, by F. J. Seaver, and a list of plants observed in the Williston area, by W. B. Bell, are included in the report.

The author gives an account of his work on seed breeding in reference to crop disease and states that the studies on the resistance of immune flax have progressed to a point where it is desirable to test different varieties under field conditions. For this purpose small amounts of seed were distributed in the spring of 1908 for cooperative trial by farmers in different parts of the State.

Seeds and plants imported during the period from July, 1906, to December 31, 1907. Inventory No. 13 (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 132, pp. 192*).—This inventory represents the acquisitions of the Office of Seed and Plant Introduction between July 1, 1906, and December 31, 1907. It contains 2,672 items, the seeds and plants being introduced for experimental purposes. Among the more important collections mentioned are those of F. N. Meyer, in northern China, and N. E. Hansen, in northern Europe and Siberia. More attention than formerly is now being paid to the introduction of small collections which are imported for the specific purpose of being used in connection with plant breeding experiments, and a considerable number of varieties of seeds and plants from different parts of the world have been secured for this purpose. In addition to the names of the plants, brief accounts are given as to their habits of growth, uses, etc.

A catalogue of the poisonous plants of Iowa, L. H. PAMMEL and ESTELLE D. FOGEL (*Proc. Iowa Acad. Sci., 14 (1907), pp. 147–176, charts 4*).—A list is given of 275 species of plants reputed to be poisonous that have been found in Iowa or suspected to occur in that State. In connection with most of them, notes are given regarding the distribution of the plants, the active principle, where it is definitely known, and the effects produced upon animals which have eaten the plants in injurious quantities.

FIELD CROPS.

Field experiments, 1907 (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 2, pp. 279–326*).—In barley experiments it was found that Danish Archer grown in Ireland 1 year and Danish Archer freshly imported were equal in value and both better than Irish Archer. This work with seed of the same variety from different sources has been in progress only 2 years. The results further show that Irish Archer grown for four successive seasons in Ireland has improved its position, and Danish Archer grown one season in Ireland has maintained it, as compared with seed freshly imported.

Of different manures applied on meadow hay the application consisting of 1 cwt. of nitrate of soda, 2 cwt. of superphosphate, and 2 cwt. of kainit per acre gave the best results.

Apparently the most suitable application for potatoes consisted of 15 tons of barnyard manure, 1 cwt. of sulphate of ammonia, 4 cwt. of superphosphate, and 1 cwt. of muriate of potash. Factor, Up-to-Date, and Duchess of Cornwall were the best-yielding varieties this season. Sprouting seed potatoes before planting increased the average yield during the 5 years by from 1 ton 13 cwt. to 2 tons 13 cwt. per acre, as compared with unsprouted seed.

The greatest profit in growing fodder beets was secured with the use per acre of 20 tons of barnyard manure, 4 cwt. of superphosphate, 2 cwt. of sulphate of ammonia, and 4 cwt. of salt. The average yield with this treatment was 34 tons 5 cwt. per acre. On the average salt produced a yield of 1 ton 10 cwt. per acre more than kainit, at a cost of about half as much. Among the best-yielding varieties may be mentioned Yellow Globe, Prize Winner, Windsor Prize Taker, and New Triumph.

The best yield of oats was secured where 1 cwt. of sulphate of ammonia, 3 cwt. of phosphate, and 3 cwt. of kainit were applied per acre, and the next best yield was obtained with a similar application but with the kainit omitted. These two applications have given satisfactory returns in each of the 5 years during which the experiment has been in progress. The best yields of grain were given by Banner and Waverly, but Potato and Black Tartarian gave heavier yields of straw.

From the experiments with turnips it was found that where 4 cwt. of superphosphate was used with 10 tons of barnyard manure a slightly heavier crop was secured than where the manure was applied alone at the rate of 20 tons per acre. Centenary was one of the best-yielding varieties, as shown by the average returns for a number of years.

Fertilizers for Jerusalem artichokes. D. Doxon (*Jour. Agr. Prat., n. ser., 15 (1908), No. 13, pp. 391–393, fig. 1*).—Experiments with different applications of barnyard manure and commercial fertilizers on Jerusalem artichokes were conducted for several years. The results indicate the importance of potash fertilizers in bringing about a high yield of tubers regular in form, smooth, easily harvested, and rich in nutritive matter.

An application per hectare of 15,000 kg. of good barnyard manure, 400 kg. of phosphatic manure either as superphosphate or slag, 200 kg. of sulphate of potash, and from 100 to 150 kg. of nitrate of soda is recommended.

Tests with different strains of root crops. H. Helweg (*Tidsskr. Landbr. Plantecavl, 14 (1907), pp. 240–275*).—First-class seed of Barre, Elvetham, and Eckendorf fodder beets was compared. The average yields per tondeland (0.734 acre) were as follows: Barre 83.7 cwt., Elvetham 80 cwt., and Eckendorf 76.4 cwt. of dry matter. Little Taarŏje, a strain of the Barre fodder beet, proved more valuable than first-class strains of Eckendorf.

Variety tests and storage experiments with fodder beets, B. Sjollema and C. K. Van Daalen (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat [Netherlands], 1907, No. 2, pp. 31–51*).—The largest yields of dry matter and sugar were produced by Mammoth, followed by "Jaapjes." These two varieties have repeatedly given the best yields in experiments conducted in different provinces of Holland. The yield of beets, as well as the average sugar content and sugar yield, were greater when the beets were planted 40 by 50 cm. than when planted 50 by 50 cm. apart.

The siloed beets lost about 2 per cent in weight from October to January and less than 1 per cent from January to April. Inversion of the cane sugar in the beets rich in sugar progressed very slowly during the first 2 months, while in the individuals low in sugar about 1½ per cent of invert sugar was formed. In the varieties lowest in sugar the invert sugar content in April had reached from 2 to 3 per cent, while in some of the richer varieties it was lower than 1 per cent. The "Jaapjes" beets showed the best keeping qualities.

Storage experiments with fodder beets, 1904–1907 (*Tidsskr. Landbr. Plantcarl, 14 (1907), pp. 571–584*).—The loss in weight and in dry matter of fodder beets kept through winter under different storage conditions was determined. The largest loss occurred in root cellars during March and April, the loss in dry matter being 1.77 per cent as compared with 0.65 per cent during November and December. Large roots lost less than small roots, the average loss in the large roots being 0.57 lb. dry matter per 100 lbs. of beets. The dry matter content of large roots decreased from 11.2 in the fall to 9.7 per cent in the spring, while the dry matter in the small roots was reduced from 13.6 per cent to 11.2 per cent during the same time.

Is it advisable to remove the leaves of mother beets when placing them in the silo? H. Briem (*Centbl. Zuckerindus., 16 (1908), No. 30, p. 840*).—The results presented in this article lead the author to recommend that mother beets be siloed with all their leaves. It is suggested that such beets be as dry as possible and be siloed above ground, the silo remaining open as long as advisable. It is stated that such silos should not be over 50 cm. (about 20 in.) high and a width of 1 meter is considered best. The author also recommends that the entire beet be left to wilt for several days before being put in storage.

Dry matter and sugar content of the beet and their importance in breeding, H. Plahn (*Centbl. Zuckerindus., 16 (1908), Nos. 23, pp. 640, 641; 24, pp. 670–672*).—The results of the investigations here reported showed that the dry matter and sugar content of fodder beets were not in exact correlation with each other. A comparison of these two factors without knowing this fact would lead to overlooking the amount of invert sugar formed during the time of storage. The dry matter content for this reason is not considered one of the principal factors in mother beet selection, and it is suggested that the basis of seed beet selection should be the results of polarization because the nutritive value of the fodder beet is mainly determined by its sugar content. It is recommended that the examination of individual beets be made in the spring, as at that season the keeping qualities of the beet are also shown.

Studies on seed formation in clover and alfalfa, H. L. Bolley (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 80, 81*).—White clover, alfalfa, and red clover plants were grown under screens to determine whether bumblebees were needed in the fertilization of clover for the production of seed. It was observed with regard to white and red clover that when grown under screens with 12 or 6 meshes to the inch practically no seeds were formed. Screens with $\frac{1}{3}$ in. and $\frac{1}{2}$ in. meshes, so far as known, proved sufficient to exclude bumblebees, but while there were a great number of unfertilized heads under these screens there were also heads which were well filled. "The work with the larger

sized meshes would seem to indicate that in some cases red clover is self-fertilized or else fertilized by small insects, while the work with the finer meshes would seem to indicate that it is seldom, if ever, self-fertilized. It is possible that wind rustling is a necessary element in this work and that the screens with the finer meshes largely prevented this." A later and more complete report on this work will be made.

Distance between hills for corn in the Illinois corn belt, A. N. HUME, O. D. CENTER, and L. HEGNAUER (*Illinois Sta. Bul. 126, pp. 357–374*).—Distance experiments with corn were conducted by the Illinois Experiment Station in different sections and on different soils in Illinois from 1903 to 1907, for the purpose of determining the distance at which check rows of corn returned the highest and most profitable yields and whether planting 2 kernels per hill at closer distances is better than 3 kernels at greater distances. The thickness of planting was varied by increasing or decreasing the distance between rows in both directions. The hills were checked on different plats at distances ranging from 33 to 44 in., the intermediate distances being 39.6 and 36 in. The different series were repeated as many times as practicable according to the size of the fields, and variations in stand were eliminated to make results comparable.

In northern Illinois on the 2-kernel plats the average yield for the 4 years ranged from 44.1 bu. per acre for the 44 by 44 in., or widest planting, to 54.3 bu. for the second thickest, or 33 by 36 in. planting. Where 3 kernels were planted per hill the widest planting produced on an average 54.1 bu., which increased as the distance was narrowed down to 61 bu. per acre for the closest, or 33 by 33 in., planting.

In central Illinois the plats planted with 2 kernels per hill increased in average yield from the widest planting to the second thickest, the yields ranging from 47.7 to 55 bu. per acre. The plats with 3 kernels in the hill ranged in average yield per acre from 46.8 bu. for the closest planting to 52.3 bu. for the 39.6 by 39.6 and the 36 by 44 in. distances. The plats planted 36 by 36 in. with 2 kernels per hill yieled 2.2 bu. per acre more than the plats planted 39.6 by 39.6 in. with 3 kernels per hill. In the northern part of the State the best yields were taken from the plats with 3 kernels per hill and also from those in which the hills were not more than 36 in. apart each way, and in the central part of the State the highest average yield from land producing over 50 bu. per acre was secured by planting 2 kernels at a distance of 33 by 36 in., but almost the same yield was obtained when the hills were planted 39.6 in. apart each way with 3 kernels per hill. On land yielding less than 50 bu. per acre practically the higest average yield was secured where 2 kernels were planted per hill in rows 36 in. apart in each direction.

It is advised that on all ordinary corn belt land in northern Illinois the hills be planted not more than 36 in. apart with at least 3 kernels per hill, and that in central Illinois on the common brown silt loam prairie lands usually producing over 50 bu. per acre corn be checked 39.6 in. apart and 3 kernels planted per hill, while on the common prairie land not generally producing 50 bu. per acre the hills should be 36 in. apart and only 2 kernels planted per hill.

Ten generations of corn breeding, L. H. SMITH (*Illinois Sta. Bul. 128, pp. 457–575, figs. 2*).—This bulletin discusses the importance of corn improvement, outlines the fundamental principles upon which this work at the station is based, reviews some of the earlier results, describes the general plan of the experiments, and summarizes the results secured during 10 years of investigation. Much of this subject matter is condensed from Bulletins 55, 82, 87, and 100 of the station previously noted (E. S. R., 11, p. 633; 14, p. 855; 15, p. 352; 17, p. 26).

The effect of breeding on the protein and oil content is shown in the following table, compiled from the general averages of each generation:

Ten generations of breeding corn for increase and decrease of protein and oil.

Year.	High protein.		Low protein.		Difference.	High oil.		Low oil.		Difference.
	Seed.	Crop.	Seed.	Crop.		Seed.	Crop.	Seed.	Crop.	
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1896	.....	10.92	.....	10.92	.....	.....	4.70	.....	4.70	.....
1897	12.54	11.10	8.96	10.55	0.55	5.39	4.73	4.03	4.06	0.67
1898	12.49	11.05	9.06	10.55	.50	5.20	5.15	3.65	3.99	1.16
1899	13.06	11.46	8.45	9.86	1.60	6.15	5.64	3.47	3.82	1.82
1900	13.74	12.32	8.08	9.34	2.98	6.30	6.12	3.33	3.57	2.55
1901	14.78	14.12	7.58	10.04	4.08	6.77	6.09	2.93	3.43	2.66
1902	15.39	12.34	8.15	8.22	4.12	6.95	6.41	3.00	3.02	3.39
1903	14.30	13.04	6.93	8.62	4.42	6.73	6.50	2.62	2.97	3.53
1904	15.39	15.03	7.00	9.27	5.76	7.16	6.97	2.80	2.89	4.08
1905	16.77	14.72	7.09	8.57	6.15	7.88	7.29	2.67	2.58	4.71
1906	16.30	14.26	7.21	8.64	5.62	7.86	7.37	2.20	2.66	4.71

With reference to protein these results show that starting with a single variety it has been possible in 10 generations of this work to increase the protein content from 10.92 per cent to 14.26 per cent, a gain of 3.34 per cent, while by breeding in the opposite direction it has been possible to reduce the protein content from 10.92 to 8.64 per cent, or a reduction of 2.28 per cent, making a total difference between the two strains of 5.62 per cent. It is further shown that the high-oil corn has increased from 4.70 per cent to 7.30 per cent of oil, while a low-oil corn has decreased from 4.70 to 2.66 per cent, the difference between the two strains in 1906 being 4.71 per cent.

High protein and low protein seed were planted together on one plat and high oil and low oil seed on another. These plats were continued for 3 years, and the results secured did not indicate that the soil influences the protein or the oil content.

A study of the secondary effects produced by selection to change the composition of the grain indicated that the change in the composition of the grain has produced no very marked effect upon the composition of other parts of the corn plant. Continued selection has apparently induced a certain correlation between protein and oil content and has resulted in characteristic types of kernel and perceptible modifications in the type of ear. Selection for high protein is considered as evidently accompanied by a reduction in yield. It was also found that climatic conditions exert in certain years a marked effect upon the composition of the corn crop as regards its protein, oil, and starch content.

The detailed plat records of the four strains and the analytical results of nearly 5,000 individual ears analyzed during the 10 years are given in tables so arranged that the maternal pedigree record of every ear is shown. The work on the four breeding plats is still being continued.

Corn: Selection, storing, curing, and testing for seed, J. A. JEFFERY (*Michigan Sta. Circ. 3, pp. 19–30, figs. 17*).—In pointing out the importance of testing corn for seed it is stated that of a large number of ears tested for vitality those selected from the shock invariably produced an exceedingly low number of germinations. More than 50 per cent of the ears produced no germination whatever, and of those that did show vitality it was rare that 100 per cent of the kernels germinated. Directions are given in detail for the selection of seed corn, its care, grading, and testing.

Testing the germination of seed corn, M. P. JONES (*New York Cornell Sta. Circ. 1, pp. 8, figs. 3*).—The selection of good seed ears, the method of making

the germination tests, and the care of seed corn are discussed in a popular manner.

The culture of cotton without irrigation, G. Prétrel (*Bul. Soc. Hort. et Aviculf. Tunisie, 7 (1908), No. 31, pp. 91–95*).—Experiments in growing cotton without irrigation were made in 1907 in the vicinity of Tunis. The results show that a good fiber, although not quite as valuable as Egyptian and American cotton grown with irrigation, can be produced in that locality under those conditions. In one of the fields in which this work was conducted, and where weather conditions did not interfere with the experiment, a yield of 7.81 kg. (about 17 lbs.) of fiber was harvested from 322 plants. It was also observed that the tap root of the plants was in most cases quite straight and long, having gone down deep into the soil for the purpose of finding the necessary moisture.

The flax stem, T. Tammes (*Natuurk. Verhandel. Holland. Maatsch. Wetensch. Haarlem, 3. ser., 6 (1907), No. 4, pp. VII+285, pls. 6*).—This publication is a monograph on statistics and the anatomy of flax. The following subjects are treated: The origin and history of cultivated flax, the variation and correlation of macroscopic characters, the influence of soil and space on flax plants, the development and structure of the stem, and the fiber. An extensive bibliography on flax and its culture is included.

Trials of hemp, H. L. Bolley (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 81, 82*).—Comparative tests were made with hemp seed secured from Russia, Manchuria, and Kentucky. The Russian hemp did not prove very satisfactory. The Kentucky seed produced hemp straw 8 or 12 ft. high, of good quality and mature, but the seed did not ripen before frost. It is believed, however, that by planting the crop earlier mature seed can be grown in that region. The Manchurian hemp when planted for seed purposes matured thoroughly, but in quality of fiber it ranked behind the Kentucky type.

Hop culture and handling, C. Fruwirth (*Hopfenbau und Hopfenbehandlung. Berlin, 1908, pp. VIII+185, figs. 59*).—This book treats of the structure and the life of the hop plant, the culture of the crop, hops as a commercial article, and the methods of promoting hop culture and commerce.

A study of the factors influencing the improvement of the potato, E. M. East (*Illinois Sta. Bul. 127, pp. 375–456, figs. 10*).—This bulletin discusses the use of species of Solanum other than the potato, cites descriptions of the original plant from the earlier writers on the subject, describes the modern plant, outlines methods of breeding, considers at some length the inheritance of characters in tuber selection, and more briefly the hypothesis of degeneration, discontinuous variations, and graft-hybrids, and reports results secured in experiments on the improvement of the tuber in quality. In the treatment of the different subjects the work of a large number of investigators is reviewed, and the bulletin concludes with a bibliography of 114 references.

The author found a great difference in varieties regarding the value of luxuriant vegetation as a guide in selecting high-yielding plants. Large vines as compared with medium vines gave fair results in most cases, but in some varieties, as Manistee, large vines rather indicated that excessive vegetative growth was opposed to maximum yields of tubers. No constant difference was found due to selection of plants with a single stem and those branching just below or just above the ground, providing other conditions were equal. There is apparently an optimum shade of color in vines constant with the variety and correlative with or a result of vigor in the plant. Light-colored vines gave fewer potatoes although of good size, while darker-colored vines either gave no set of tubers or a large set of very small ones.

A study was also made of the four physical divisions of the tuber, these being designated from outside to inside as skin, cortical layer, outer medullary layer, and inner medullary layer. The varieties used in this connection were Rural New Yorker No. 2 and Carman No. 3. It was found that the dry matter is quite variable and regularly decreases from the outside to the inside of the three inner zones. The total nitrogen content is only slightly variable, although showing a regular increase to the inner medullary layer on the dry basis. Ash determinations varied little from 0.90 per cent on the fresh basis, indicating a higher carbohydrate content in the cortical layer and a low one in the inner medullary layer. This is considered as showing that there is a difference in the time of cooking in the different zones. A number of methods of sampling were tried, and the most satisfactory results were secured by cutting a cylinder with a 12 mm. cork borer parallel to the long diameter but a little to the side. Variation in nitrogen content did not show a noticeable effect on quality, although it appears that extremely high nitrogen might make the flavor more pronounced. On the other hand, it was found that there is a lower limit in the amount of dry matter or more probably of carbohydrates, below which tubers can not be of good quality. In Rural New Yorker No. 2 it was found to be about 18 per cent, or probably about 15 per cent of starch.

In observations to determine a correlation between physical structure and quality it was found that anatomical difference is a varietal character, the difference between varieties being very great. The difference in quality within the variety, however, was found to be almost as great as the difference between varieties. This method of determining the quality of the tuber through its anatomical structure can not be used for selecting potatoes for the table because it is necessary to cut the tubers. In enumerating and discussing other factors influencing quality, it is pointed out that the number of eyes has a marked effect, due to the fact that the internal medullary extends a branch to each eye. This fact makes the quality vary inversely with the number of eyes. In a count of 219 tubers of Rural New Yorker No. 2 the number of eyes varied from 7 to 28. In connection with this work 189 tubers of this variety were analyzed and a large number found to be of very good cooking quality, although the average 200, and 400 lbs. per acre.

Investigations on the influence of fertilizers on quality showed that the quality grew markedly better where potassium chlorid was applied at the rate of 300 lbs. per acre, but apparently little difference resulted from doubling the applications of phosphorus in the form of bone meal given at the rate of 100, 200, and 400 lbs. per acre.

A microscopical examination in connection with a study of the influence of maturity on the quality showed that the starch grains in the cells of the immature tubers are small in size and few in number. In the cortical and outer medullary layers of mature tubers the starch grains averaged about 75μ and were found as large as 105μ, while in immature tubers under an ounce in weight the starch grains averaged only 25μ. The composition of tubers of different degrees of maturity was determined and from the results it is concluded that quality depends upon homogeneous anatomical structure, dry matter content, and degree of maturity. In general the quality increases with the thickness of the cortical layer and decreases as the number of eyes increases. The dry matter content must be such that the cooked starch fills the cells to the bursting point. The degree of maturity is affected by all factors of soil physics, soil fertility, cultivation, and climate during the growing period.

In studying the variation of the potato in chemical composition as a basis for its improvement it was found that the nitrogen content does not vary directly with the number of eyes, that it is not correlated with particular shapes, that

smaller and younger tubers are richer in nitrogen than larger and older ones, and that the error in determining starch from specific gravity tables is much greater than is generally supposed. Selections were made to determine whether the fluctuations in a chemical constituent are transmitted by tuber propagation. One plat in 1902 was planted with tubers containing an average of 2.95 per cent of nitrogenous matter in the fresh substance. A second plat was planted with low protein selections, the average nitrogenous matter in the fresh substance being 1.78 per cent. The composition of the tubers harvested did not indicate a definite response to selection for high or low protein, although the average of nitrogenous matter when calculated to a water-free basis was 2.11 per cent higher in the high nitrogen selections than in the crop from the low nitrogen selections. In 1903 similar selections were again made, but from other potatoes than those grown on these two plats, and it is not considered that very definite conclusions can be drawn from the results secured. It is pointed out, however, that there is a difference of 0.81 per cent in dry matter in favor of the high protein plat. Attention is also called to the fact that the low protein potatoes were larger, and it is pointed out that the higher dry matter should have ordinarily been expected from the low protein potatoes on account of their greater size. A difference of total nitrogenous matter in favor of the high protein plat of 0.33 per cent on the fresh basis and 1.61 per cent on the dry basis is recorded.

In general statements on the improvement of the potato the author presents three possible methods of improvement: (1) The crossing of desirable plants and raising of many seedlings under controlled conditions; (2) selections of the most desirable fluctuations among the plants and tubers of a variety; and (3) selection of discontinuous variations, and a study of ways of causing them, a possible example being the so-called graft-hybrid.

Irish seed potatoes in England, 1907 (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 2, pp. 254–259*).—The results shown in tables and discussed indicate that Irish seed produces much heavier crops in England than English seed, even when the English seed is changed from one district to another. It is recommended that for the purpose of supplying the English market with seed from Ireland varieties popular in England should be grown, only seed pure and true to name of well-selected tubers should be put on the market, and the seed crop should be slightly immature to favor early ripening, the production of vigorous plants and of heavy yields.

Solanum commersonii violet and the Blue Giant, G. H. Pethybridge (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 2, pp. 247–253*).—The results of this comparison led to the conclusion that the claims for *S. commersonii* violet regarding special cropping power, suitability to wet soils, disease and frost resistance, and excellence of flavor have not yet been established for Ireland, and that the variety if not absolutely identical with the Blue Giant so far resembles it that the enhanced price of seed for *S. commersonii* is not justified. It is stated that far better varieties are already in cultivation in Ireland than *S. commersonii* violet.

Dwarf Essex rape for winter forage, J. M. Scott (*Florida Sta. Bul. 95, pp. 21–25, figs. 2*).—Brief directions for the culture of rape and its use for feed are given, and the results of culture and fertilizer tests are reported. Rape at this station has given yields ranging from 27,200 to 33,296 lbs. of green forage per acre. On September 25, 1907, plats 1 and 2 were sown in drills 30 in. apart on a very light sandy loam soil. December 21 plat 3 was sown. On September 25 plat 1 received 389 lbs. per acre of a complete fertilizer, plat 2, 778 lbs., and plat 3 on December 21, 615 lbs. Plat 2 received a second application of 389 lbs. on February 10, 1908. The best yield, which was secured from two cuttings,

amounted to 16.59 tons per acre on plat 2. Plat 3 showed no increase over plat 1.

Ten years' trials with different varieties of rye, M. L. MORTENSEN and K. HANSEN (*Tidsskr. Landbr. Plantcavl, 14 (1907), pp. 45–150*).—This report covers trials conducted at 4 different stations in Denmark during 1894 to 1905. The highest yields of grain were obtained from Brattingsborg, Petkus, Heine Improved Zeeland, Heinrich, and Probstei in the order given. Walkenhaus and Brattingsborg ranked first in straw production, while Schlanstedt, Petkus, and Heinrich in the order mentioned produced the stiffest straw. The average content of nitrogen in the water-free kernels ranged from 1.51 per cent in Petkus to 1.66 per cent in Hoffmansgave, and the content of crude fat from 1.72 per cent in Probstei to 1.86 per cent in Hoffmansgave. A discussion of the history and characteristics of the various varieties is given.

The fertilizing value of hairy vetch for Connecticut tobacco fields, T. R. ROBINSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 15, pp. 5*).—In connection with a discussion of this subject the importance of inoculating hairy vetch is pointed out. Results of field and pot experiments secured along this line are reported.

Sample cuttings of hairy vetch in 1907 at Hockanum, Conn., indicated yields of 7 tons 400 lbs. per acre of green material for the inoculated vetch and 2 tons 240 lbs. for uninoculated vetch. Rye on this land made a vigorous growth, yielding at the rate of 7 tons 720 lbs. per acre. Determinations of total nitrogen in samples of this soil, made by the Bureau of Chemistry of this Department, showed that the soil where vetch was grown without inoculation contained 0.19 per cent of total nitrogen, while the soil from the rye plats contained only 0.17 per cent and that from the uninoculated vetch plats 0.14 per cent.

Results of greenhouse tests with 20 plants each showed that uninoculated hairy vetch produced 25 gm. of dry weight with 0.82 gm. of nitrogen, inoculated plants 44 gm. of dry weight with 1.33 gm. of total nitrogen, and rye 16 gm. of dry weight with 0.27 gm. of total nitrogen. Assuming that one-fifth of the green weight represents the dry weight of vetch, the author calculates that on the cover-crop plats at Hockanum inoculated vetch furnished a crop of 2,880 lbs. dry weight per acre with 100.51 lbs. of nitrogen, uninoculated vetch 848 lbs. of crop with 28.91 lbs. of nitrogen, and rye a crop of 2,944 lbs. dry weight with 49.75 lbs. of nitrogen per acre.

In pot experiments with tobacco, sodium nitrate was applied at the rate of 200 and 500 lbs. per acre. This was applied in pots in which hairy vetch and rye had been grown and turned under or removed. It appeared that the turning under of inoculated hairy vetch was slightly superior to the application of 200 lbs. of sodium nitrate per acre, while the turning under of rye was inferior to the application of the fertilizer. When cover crops were turned under and fertilizer added the hairy vetch showed greater fertilizing power than rye. In pots that had borne no cover crop the application of nitrate of soda at the rate of 500 lbs. per acre was no more effective than the use of 200 lbs.

[Comparative and chemical studies of wheat varieties], W. H. SCHERFFIUS and H. WOOSLEY (*Kentucky Sta. Bul. 135, pp. 327–340, pls. 11*).—The 12 best yielding varieties for the years 1905, 1906, and 1907 ranged in yield from 27.41 to 31.16 bu. per acre. The leading sorts given in decreasing order of their yields were Jersey Fultz, Kansas Mortgage Lifter, Fulcaster, B 377, and Beechwood Hybrid, all producing 29.23 bu. per acre or over.

In determining the number of pounds of straw required for each variety to produce 1 bu. of grain it was found that no regular relation between the yield of straw and grain was apparent. The high yields of straw, however, were

generally associated with low yields of grain. Blue Stem produced 95 lbs. of straw per bushel of grain, while No. 9129 produced 218 lbs., these two varieties standing lowest and highest in straw production, respectively. The average yields of straw for the 3 years and for all of the varieties under test ranged from 2,637 to 3,547 lbs. In average weight per bushel for 1905 and 1906, Turkish Red stood first with 62¼ lbs. for the first season and 61½ lbs. for the second.

Tables are given showing the protein content of wheat of the different varieties on an air-dry and water-free basis. It was found that weevil-infested wheat contained relatively more nitrogen and protein than wheat not infested, showing that the weevil had fed on the starch-bearing portion of the grain. The tables also show that some of the high-yielding wheats, such as Kansas Mortgage Lifter and Fulcaster, may also be rich in protein and that the protein content of a given variety varies with the season.

Some new hybrid wheats, E. E. Elliott and C. W. Lawrence (*Washington Sta. Popular Bul. 9, pp. 8*).—The methods of improving wheat are outlined and the hybridization work at the station is described. A table is given showing the yields at Pullman for 3 years of 20 new hybrid wheats. Eight hybrid varieties derived from Winter Fife and Little Club gave an average yield of 46.25 bu., 5 varieties, crosses between Turkey and Little Club, 42.80 bu., 4 hybrid sorts from White Track and Little Club 43.75 bu., and 3 crosses between McPherson and Red Chaff 36 bu. per acre. Two standard Red Russian varieties grown for comparison gave an average yield of 42.25 bu. per acre for the same period. Ten hybrid varieties of true winter wheats with club heads are described.

HORTICULTURE.

A further study of soil treatment in greenhouse culture, H. J. Wheeler and G. E. Adams (*Rhode Island Sta. Bul. 128, pp. 183–194*).—In a previous bulletin of the station (E. S. R., 17, p. 464), the results are given of a study of the initial and residual effects of stable manure and different combinations of chemical manures used with greenhouse radishes, tomatoes, and cucumbers and of a test of finely cut hay as a soil improver. In similar experiments reported in this bulletin finely cut rye straw was substituted for the hay which often contains weed and grass seed.

The first crop grown was radishes planted shortly before December 1, followed by lettuce planted on February 14 and again by lettuce planted on May 7. The same 4 plats and the same fertilizers were used as in the previous work except that before planting the second crop of lettuce the stable manure plat was remanured and the other plats received a complete fertilizer containing a large amount of basic slag meal, but no sulphates or chlorids.

With radishes it was found that partially composted horse manure applied at the rate of 75 tons per acre gave better results than any of the chemical manures used either with or without cut rye straw. The crop where the cut straw was used matured much more quickly than with chemicals alone. The manure and straw appeared to exert a beneficial effect upon the physical condition of the soil "and thus possibly indirectly upon the character of the fungi and bacteria capable of existing therein." This beneficial effect was not so marked with the first crop of lettuce, although the stable manure plat gave slightly earlier maturity and the crop matured somewhat earlier where cut straw was used than where the chemicals were used alone. Although the stable manure plat was remanured previous to the second crop of lettuce, better results were secured with the chemicals and the cut straw than with the horse manure. With the same chemicals the weight of the heads where the cut straw

had been used was considerably greater than where it was omitted. With both the radishes and lettuce nitrate of potash and nitrate of soda appear to be much superior to muriate of potash and sulphate of ammonia as sources of potash and nitrogen.

Carnations were grown in the same kind of subsoil as that used with radishes and lettuce. The bench was divided into two equal beds. One bed received a complete fertilizer while the other received no nitrogen, the object of the experiment being to ascertain what influence, if any, would be exerted by the nitrogen upon the tendency of the calyx to split open. The results appear to show that when the house is maintained at the same temperature generous manuring with nitrogen may increase the total number of perfect blooms of one variety of carnations and lessen the number of another variety.

The French garden, C. D. McKay (*London, 1908, pp. 62, pls. 9*).—A brief practical treatise on the intensive cultural methods employed by French market gardeners including data relative to crop rotations and working instructions for each month in the year. The work is issued with a view of introducing French methods among English gardeners.

Orchard cover crops, W. S. Thornber (*Washington Sta. Popular Bul. 8, pp. 4*).—A popular discussion of the value of orchard cover crops with suggestions for planting and plants to use.

Fruit marketing investigations in 1907, J. E. Higgins (*Hawaii Sta. Press Bul. 21, pp. 27, fig. 1*).—The practical results for 1907 of fruit marketing investigations which have been conducted by the station for the past 4 years (E. S. R., 19, p. 338) are given and subjects relating to transportation, markets, and organization for market purposes are discussed.

On August 14 a carload of pineapples and avocados was shipped from Hawaii to Chicago. The pineapples were sorted and repacked in San Francisco, but the avocados were not repacked. The fruits were placed in a refrigerated car, arriving in Chicago, August 31, and were marketed September 3. The pineapples were in good condition, the loss being less than 1 per cent. The avocados were in good condition for immediate consumption, but hardly firm enough for the market. It is believed that if avocados are perfectly hard when taken from the steamer, they will arrive in Chicago in the same condition. It appears thus far that papaias will not endure a long journey by rail, after reaching the mainland.

Hay and excelsior were again compared for packing pineapples in crates. The fruit was preserved equally well in both materials, but the excelsior makes a better appearance. The keeping quality of pineapples from different fields continues to show a wide variation and emphasizes the importance of soil studies and fertilizer experiments in relation to the keeping qualities of the fruit.

The results from shipping long and short stem fruits confirm those previously reported. On fruits showing a great tendency to decay in transit the part saved by cutting long stems averaged 17 per cent of the whole. The difference in favor of long stems as compared with stems broken off at the natural joint was over 46 per cent.

The value of wrapping each fruit in paper was again brought out, the average difference in favor of the wrapped fruit being about 6.6 per cent. Fruits that were cut with long stems and also wrapped in paper showed an average saving of 22.37 per cent of the whole as compared with short stem fruits packed without paper.

There appears to be no constant advantage in favor of carrying pineapples on either the orlop deck or the after deck of the ship. The need of furnishing transportation facilities equipped to handle fruit in all weather is pointed out.

A portion of the pineapples was placed in the ship in a compartment held at a temperature of 50° F. The fruit was not pre-cooled and the compartment did not attain the above temperature until 2½ days from the time of sailing. Under these circumstances the loss was practically the same in refrigeration as on the after deck.

Shipments were made to San Francisco of Chinese bananas, some bunches of which were wrapped in dried banana leaves and others were entirely unprotected. Neither method was satisfactory. The results previously secured relative to methods of picking, packing, and shipment of avocados were confirmed in 1907. It is especially emphasized that the spaces between the avocados should not be filled with paper as is often done.

Cape fresh fruit export trade, season 1908. C. Du P. Chiappini (*Cape Good Hope, Spec. Rpt. Trades Comr. London, 1908, pp. 16*).—A report on the export fruit shipments of the Cape of Good Hope relative to the size of the shipments, condition of the fruit, prices received, varieties, grading, and packing, with suggestions and recommendations to growers for improving conditions and for the further extension of the fruit business.

Peach, apricot, and prune kernels as by-products of the fruit industry of the United States. F. Rabak (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 133, pp. 7–34*).—The present commercial supply of almond oils is derived from European countries and is manufactured, not alone from almonds, but to a great extent from apricot, and in some cases, peach kernels. This bulletin contains the results of an investigation conducted to obtain information as to peach, apricot, and prune kernels, with special reference to their similarity to sweet and bitter almonds and to compare chemically the fixed and volatile oils obtainable from them. The methods of extracting these oils are discussed in detail and consideration is given to their commercial uses.

The investigation shows that the fixed and volatile oils which can be derived from peach, apricot, and prune kernels compare very favorably as to their physical and chemical properties and in some cases are almost identical with the commercial oils obtained from sweet and bitter almonds. The oils from these kernels are at the present time substituted for the rarer almond oils and can be used for the same purposes. Peach, apricot, and prune kernels are cheaper and furnish a more available raw material than bitter almonds. Hence their increased use might sufficiently reduce the price of these oils and create a greater demand for them. Owing to the ready saponification of these oils they should find a demand in the toilet-soap industry, and their production in the United States is suggested on account of the large amount of raw material available. The processes of extracting and distilling fruit-kernel oils are not particularly complex and could be carried on in establishments such as canneries already equipped with steam or other power at comparatively small expense. It is suggested that the press cake, owing to its high content of nitrogenous matter, might be employed either as a stock food or as a fertilizer.

Commercial fertilizer experiments with coffee. G. Helmrich (*Tropenpflanzer, Beihefte, 9 (1908), No. 4, pp. 185–220, pls. 12*).—An extensive series of fertilizer experiments conducted by the author on his plantations in Guatemala are reported. Potash, phosphoric acid, nitrogen, and lime were used both alone and in combination and were compared with stable manure. The results are presented in tabular form and are fully discussed. The author concludes that although the application of the organic manures is indispensable in coffee culture, the best plants and largest returns are secured by the additional use of a complete fertilizer.

The future of cacao planting, H. H. Smith (*London, 1908, pp. XIII+95, pls. 2*).—A paper read at the Colonial Fruit Show of the Royal Horticultural Society, June, 1908, followed by an extensive discussion and supplementary notes on grafting, pruning, and the question of shade in Trinidad. The paper deals with the various branches of the cacao planting industry, including certain phases which have not been generally discussed, such as suggestions relative to the use of vacuum chambers for drying beans, the practice of planting belts of rubber and other economic plants in conjunction with cacao, and restriction of affected areas in case of disease. Among other points discussed are grafting, improved pruning methods, and green manuring.

Street trees, their care and preservation, A. D. Taylor (*New York Cornell Sta. Bul. 256, pp. 451–491, figs. 37*).—In this bulletin the writer points out and shows by means of illustrations and discussion the harm to which trees are subjected through ignorance and neglect, with a view of interesting public spirited citizens in the protection of shade trees. Part I deals with the sources of injury to shade trees including public utilities, unintelligent pruning, construction work, wind and ice storms, freezing, bites of horses, grazing of wagon wheels, starving of root systems, overcrowding and improper placing, and injury from wire labels. Part II deals with methods of protection and the pruning of shade trees, and Part III contains a discussion of some of the main points in the municipal control of shade trees with notes on protective measures adopted in various States.

The small country place, S. T. Maynard (*Philadelphia and London, 1908, pp. 320, figs. 100*).—A popular work intended for persons seeking country homes and for those already owning small country places who wish to improve them and make them more profitable. In the introductory chapter consideration is given to various economic and social phases of country life. Succeeding chapters deal with the remodeling and improving of old buildings, building new houses, the decoration of home grounds, the lawn and flower garden, the family garden, practical suggestions for the growing and handling of the common orchard and small fruits and vegetables, poultry keeping, dairying, the family horse, and bees. The book concludes with a monthly working calendar.

The preservation of cut flowers, V. Ducomet and L. Fourton (*Rev. Hort. [Paris], 80 (1908), No. 14, pp. 333–336*).—The results are given of experiments conducted in 1906 and 1907 in continuation of the authors' previous investigation (E. S. R., 18, p. 44), in preserving cut flowers in solutions made by using various mineral and organic acids, bases, salts, antiseptics, and other materials.

Fully ten thousand experiments were conducted in which flowers of over one hundred species were used. The important fact brought out by the work is that the flowers differ so much in their requirements as to render it impossible to use similar treatment or a uniform liquid for preserving all plants. In many cases which are noted, however, it is found that by the use of sugar as well as several other substances of which the principal are sodium chlorid, bi-potassium phosphate, chloral and sulphate of maganese, the life of the flowers can be prolonged sufficiently to warrant the extra expense.

Exploitation of medicinal plants (*Le Brésil: Ses Richesses Naturelles; ses Industries. Rio de Janeiro: Centro Indus. Brasil, 1908, French ed., vol. 1, pp. 228–238*).—Brief notes on the more important medicinal plants of Brazil, including local and botanical names and economic uses, together with statistical data relative to the exports and value of various leaves, roots, and medicinal extracts.

FORESTRY.

Neudamm forestry manual, A. SCHWAPPACH ET AL. (*Neudammer Förster-Lehrbuch. Neudamm, 1908, 3. ed., XIX+818, pls. 6, figs. 203; Repetitorium, pp. 228*).—The first edition of this work, which is offered as a guide for instruction and practice as well as a handbook for the private forest owner, appeared in 1899. The present edition has been considerably enlarged and revised. The work is diveded into 9 parts, treating in detail the following phases of forestry: Botany, zoology, locality factors, forest mathematics and mensuration, sylviculture, utilization, protection, valuation, and hunting, fishing, bee culture, and fish and game protection. An appendix deals with the measures and laws relative to the insurance of workmen and forest officials. In addition to the text figures there are colored illustrations of 117 different forest insects.

The work is accompanied by a supplement containing 1,431 questions and answers, with cross-references to the related paragraphs in the manual.

Forest survey methods, A. H. D. ROSS (*Canad. Forestry Jour., 4 (1908), No. 1, pp. 39–52*).—A discussion of methods employed in making a complete forest survey which the author states includes a more or less accurate plane and topographic survey of the tract under examination, a careful estimate of the amount of timber upon it, a determination of the rate at which the timber is growing, and a study of the conditions of light, moisture, soil, and other factors influencing both the present and future condition of the forest crop.

Handbook on forest mensuration of the white pine in Massachusetts, H. O. COOK (*Boston, 1908, pp. 5–50, figs. 8, dgms. 5*).—A handbook prepared by the author under the direction of the State Forester, F. W. Rane, with a view to furnishing the people of Massachusetts with a practical working knowledge of commercial forest values. The data given include log scales, volume tables, yield tables, financial rotations, thinnings and growth tables, together with miscellaneous notes of interest chiefly to lumbermen and mill owners. Descriptions and illustrations of instruments for measuring heights as found in Bulletin 36 of the Forest Service of this Department (E. S. R., 14, 576) are also given.

Fertilizer experiments with pine on high moorland, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 8, pp. 395–407, figs. 3*).—Potash, phosphoric acid, nitrogen, and lime were tested both alone and in various combinations as a fertilizer for pine seedlings in new moorland soils. The investigations were started in 1897 and concluded during the present year.

Good results were secured whenever phosphoric acid was used alone or in combination with one or more of the remaining elements, but the largest, most luxuriant, and greenest plants with long needles and well-developed buds were produced by the use of a complete fertilizer. Phosphoric acid in basic slag was much less available than that in bi-sodium phosphate. Superphosphate influenced the plants unfavorably, hence it is advised that a quick-acting phosphate be used on the high moorland. The lack of phosphoric acid, a dwarfed condition of the seedlings, and the presence of anthocyanin, indicated by a red coloration of the pines, appear to coincide, although a red coloration was noted to some extent with large and luxuriant-growing seedlings.

The author is of the opinion that the formation of anthocyanin occurs under too varying conditions to be given any definite biological explanation. It is suggested that the lack of phosphoric acid necessary for albumin and cell building may prevent the utilization or conversion of sugar, which thus becomes stored up and leads to the development of anthocyanin.

A test was also made of pine seed secured from different sources. The seedlings showed an important variation in size and color in the first and second years. The seed obtained from Galicia and Eberswald produced large quick-growing plants, while seed from Finland and Norway produced small slow-growing plants. During the present year, when the experimental plat became severely attacked by the needle blight, the seedlings from the northern-grown seed remained almost free from attack, while the Eberswald seedlings were badly affected in the lower part of the plant. The Galicia seedlings were still more severely attacked, notwithstanding that they were sprayed with Bordeaux mixture and later on with copper carbonate solution.

The author points out that newly planted conifers must be considered as sick or weakened plants particularly liable to attack by weevils and bark beetles. The relation between the bark turgidity and insect attack is briefly discussed.

Eucalyptus in California, N. D. Ingham (*California Sta. Bul. 196, pp. 29–112, figs. 69*).—This bulletin contains the results of an extensive study of eucalyptus culture in California, the work being based on careful observation over all the cultivated portions of the State south of Shasta County. Consideration is given to the importance of eucalyptus for timber, fuel, and oil, the soil requirements and methods of growing these trees, the commercial qualities of the different species, their adaptation to conditions in the various parts of the State, and the quality and amount of the product which can be reasonably expected from them.

Over 65 different species and varieties of Eucalypts are growing on the University of California Forestry Station grounds at Santa Monica. Of this number 18 species held to be the most promising for commercial planting in California are specially considered relative to their botanical characteristics, present range, adaptability and use, illustrations being given of the trunk, foliage, and fruiting organs of each. Lists are also given of those species the wood of which is the most durable in the soil, the lumber and fuel species, and the frost and drought-resistant species.

The possibility of selecting a group of Eucalypts capable of furnishing bloom for bees to work on the year round is suggested and a list is given showing the blooming periods of the species growing on the station grounds. Data are also given on some strength tests of Eucalypts conducted by the Forest Service of this Department in cooperation with the State of California.

Basket willow culture, C. D. Mell (*Lebanon, Penn., 1908, pp. 10*).—This pamphlet contains practical instructions for planting, cultivating, harvesting, and marketing basket willows, together with notes on varieties, insect enemies, cost and profit of a basket willow holt, and utilizing willow bark.

The drifting-sand problem, W. Gill (*Jour. Dept. Agr. So. Aust., 11 (1908), No. 11, pp. 1028–1031*).—In addition to a brief discussion relative to the causes of drifting-sand areas and their treatment, a list is given of 28 shrubs and trees which the author considers best for sand-binding purposes in South Australia.

Silvical leaflets (*U. S. Dept. Agr., Forest Serv. Silv. Leaflets, 15, pp. 4; 16, pp. 2; 17, pp. 2; 18, pp. 5; 19, pp. 5; 20, pp. 2; 21, pp. 3; 22, pp. 3; 23, pp. 2; 24, pp. 2; 25, pp. 3; 26, pp. 2; 27, pp. 2; 28, pp. 3; 29, pp. 2; 30, pp. 2; 31, pp. 4; 32, pp. 3; 33, pp. 2; 34, pp. 2; 35, pp. 2; 36, pp. 2; 37, pp. 3; 38, pp. 7; 39, pp. 2; 40, pp. 2; 41, pp. 3; 42, pp. 4*).—A series of leaflets, each one dealing with the range and occurrence, climatic adaptability, habit, associated species, soil and moisture, tolerance, and reproduction of one of the following species of trees, the order given corresponding to the leaflet numbers above: White spruce (*Picea canadensis*), single-leaf piñon (*Pinus monophylla*), four-leaf piñon (*P. quadrifolia*), redwood (*Sequoia sempervirens*), bigtree (*S. washingtoni-*

ana), weeping spruce (*Picea breweriana*), Jeffrey pine (*Pinus jeffreyi*), amabilis fir (*Abies amabilis*), bristle-cone pine (*P. aristata*), bristle-cone fir (*A. venusta*), cottonwood (*Populus deltoides*), foxtail pine (*Pinus balfouriana*), Torrey pine (*P. torreyana*), black spruce (*Picea mariana*), blue spruce (*P. parryana*), California swamp pine (*Pinus muricata*), black hemlock (*Tsuga mertensiana*), tamarack (*Larix laricina*), digger pine (*P. sabiniana*), Coulter pine (*P. coulteri*), alpine larch (*L. lyalli*), knobcone pine (*P. attenuata*), white-bark pine (*P. albicaulis*), paper birch (*Betula papyrifera*), Monterey pine (*P. radiata*), swamp cottonwood (*Populus heterophylla*), chestnut oak (*Quercus prinus*), and sugar maple (*Acer saccharum*).

Exploitation of forests (*Le Brésil: Ses Richesses Naturelles; ses Industries. Rio de Janeiro: Centro Indus. Brasil, 1908, French ed., vol. 1, pp. 214–227*).—Notes on forest trees growing in northern, central, and southern parts of Brazil, including the local and botanical names, physical properties, and economic uses.

First report on a study of forest conditions of Kentucky, J. S. Holmes and W. Bradfield (*Bien. Rpt. Bur. Agr., Labor, and Statis. [Ky.], 17 (1906–7), pp. 37–120, map 1*).—The Forest Service of this Department, in cooperation with the Kentucky State Board of Agriculture, Forestry, and Immigration, is making a study relative to the present forest conditions in Kentucky and means for their improvement. Thus far, the study has been completed on 2 watersheds, the Big Sandy and Little Sandy rivers, including 11 counties in the eastern and northern sections of the mountain region.

The results of the investigation to date are embraced in the present report. Brief consideration is given to the physiographic features, classification, ownership, and valuation of land, and to transportation, and considerable tabular data is presented and discussed showing the annual output of forest products, together with the estimated present stands in this region. The forests are discussed both by type and species, and a local description is given of the forest conditions in each of the 11 counties to show the immediate need for the adoption of some definite method of caring for the forest land. An account is given of the timber and other forest industries relative to methods of exploitation and suggestions for their improvement. Other features discussed are agriculture and mining in their relation to forestry, protection from fire and stock, planting, and taxation. An appendix contains a list of trees and shrubs noted in the region, and a map showing forest conditions in eastern Kentucky is also given.

It is recommended that a technically trained and experienced forester be appointed to take charge of all State work, and that lands more valuable for forest purposes than other purposes should be held and administered by the State as State forests. The establishment of experimental planting stations and a fire warden system is also advised.

The management of the provincial forests of d'Amance, E. Cuif (*Rev. Eaux et Forêts, 47 (1908), Nos. 11, pp. 326–339; 12, pp. 353–362; 13, pp. 387–404; 14, pp. 421–428*).—A résumé of a recent report on this subject in which the various systems of management which have been in force in the d'Amance forest since 1826 are considered relative to the conditions under which they were exercised and the results produced from their execution together with recommendations for the future exploitation of this forest. Considerable tabular data relative to growth tables, etc., are given as well as tables outlining methods of exploitation for a period of 15 years from 1907 to 1921.

Report on the forest administration of the Central Provinces for the year 1906–7, A. F. Gradon, G. S. Hart, and C. G. Rogers (*Rpt. Forest Admin. Cent. Prov. [India], 1906–7, pp. 7+16+20+16+XCIX*).—This is the annual report of the forest conservators of the Northern, Southern, and Berar circles on the forest administration in the Central Provinces for the year 1906–7. The impor-

tant data relative to alterations in forest areas, progress on working plans, forest surveys, forest settlements, forest protection and exploitation, revenues, expenditures, yields, etc., together with a financial statement, are presented in tabular form.

Progress report on forest administration in the Province of Eastern Bengal and Assam for the year 1906–7, W. F. L. Tottenham (*Rpt. Forest Admin. East. Bengal and Assam, 1906–7, pp. 64+3, map 1*).—Data similar to the above are presented relative to the constitution and management of State forests in the Province of Eastern Bengal and Assam.

Annual progress report on forest administration of the lower provinces of Bengal for the year 1906–7, A. L. McIntire (*Rpt. Forest Admin. Bengal, 1906–7, pp. II+51+5*).—Data similar to the above are presented relative to the administration of the State forests of the lower provinces of Bengal.

Report on the forest administration of Southern Nigeria for 1906, H. N. Thompson (*Colon. Rpts., Misc. [Gt. Brit.], No. 51, pp. 4–90*).—A report on operations in the forest reserves of the Western, Central, and Eastern provinces of Southern Nigeria including an examination of the forest areas, alterations in area, forest protection, silvicultural operations and the exploitation of timber, rubber, gums, fibers, oil beans and seeds, with a financial statement for the year. Notes are also given on the work of the botanical stations and cultural experiments with various agricultural crops. In the appendices are descriptive notes on the forests of Southern Nigeria as well as notes on the climate of that country, and miscellaneous tabular data connected with the report.

The use of fluorid as a preserving material for wooden poles, R. Nowotny (*Österr. Chem. Ztg., 11 (1908), No. 12, pp. 164–166*).—A description is given of experiments under way in Austria in which zinc fluorid is being tested as a preserving fluid for telegraph poles, including data relative to the methods of impregnation, and penetration.

With poles treated with zinc fluorid in 1905 and 1906 and examined in 1907, from 88 to 100 per cent were found to be free from fungus attacks, whereas 50 per cent of the poles treated with copper sulphate were found to be more or less seriously attacked. With creosoted poles treated at the same time 93 to 100 per cent were found to be completely free from attack.

The chemical industries utilizing wood—its products and industrial extracts, P. Dumesny and J. Noyer (*L'Industrie Chimique des Bois—leurs Dérivés et Extraits Industriels. Paris [1908], pp. III+402, figs. 107*).—This is a scientific and technical treatise on the utilization of wood in the production of chemicals and extracts. The work is designed to meet the needs of both the manufacturer and the student.

Part 1 treats of the distillation of wood. General consideration is given to the development and extent of the industry and the physical and chemical properties of the principal products of distillation—charcoal, methyl alcohol, creosote, acetic acid, and acetone. An account follows of the important analytical methods and processes, including equipment employed in producing these and derived products.

Part 2 of this work deals with the analytical methods, processes, and apparatus employed in the manufacture of various tanning extracts, including extracts of chestnut, oak, quebracho, sumac, and various other tanning materials. Data are also given relative to capital employed, estimated cost of operations, importance and extent of the extract business in France, Corsica, and Italy, and imports and exports of extracts in France since 1900, as well as an account of the utilization of tanning extracts in the tannery.

Italian camphor, I. Giglioli (*La Canfora Italiana. Rome: Min. Agr., Indus., e Com., 1908, pp. 292, pl. 1, fig. 1; Atti 6. Cong. Internaz. Chim. Appl., 4*

(1906), pp. 200–342, fig. 1).—A monograph on the camphor tree (*Cinnamomum camphora*) and its products, from a historical, industrial, commercial, and cultural standpoint, with special reference to the introduction of camphor culture into Italy, together with tabulated data relative to analytical studies of camphor extracted from the leaves of trees growing in different parts of Italy.

The work concludes with an extensive classified bibliography of the camphor tree and its products.

Rubber extraction (*Le Brésil: Ses Richesses Naturelles; ses Industries. Rio de Janeiro: Centro Indus. Brasil, 1908, French ed., vol. 1, pp. 169–187*).—A general account of the rubber industry in Brazil, including the prevailing methods of exploitation, varieties, and the important rubber-producing regions, together with considerable statistical data relative to production, valuation, and exports of rubber.

Ecanda rubber (Raphionacme utilis), O. Stapf (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1908, No. 5, pp. 209–215, pl. 1*).—The author is of the opinion that the tuberous rubber plant found in Portuguese West Africa and reported by C. E. de Mello Geraldes (E. S. R., 19, p. 345) is identical with specimens later received at Kew both from West Africa and from Mozambique. The important features of Professor Geraldes's account of this plant, including extraction tests, are given, together with a preliminary botanical description and a plate showing the specimens grown at Kew.

The plant, which belongs to the genus Raphionacme, of which about 20 species are known, nearly all of them natives of tropical Africa south of the equator, has been named *R. utilis* by Brown and Stapf.

DISEASES OF PLANTS.

Plant diseases in 1907, M. L. Mortensen, S. Rostrup, and F. K. Ravn (*Tidsskr. Landbr. Planteavl, 15 (1908), No. 1, pp. 145–158*).—A general survey of diseases of agricultural crops in Denmark during the year.

Trials with the hot-water treatment for six-rowed barley, F. K. Ravn (*Tidsskr. Landbr. Planteavl, 15 (1908), No. 1, pp. 159–176*).—Either of the following methods is recommended on the basis of the trials reported: Dipping the grain 20 times during 5 minutes in water at 56 to 57° C., and immediately cooling it in the air; or soaking the grain in cold water for 3 hours, subsequently allowing the wet grain to stand for 10 hours, then dipping it 20 times during 5 minutes in water at 50 to 52° C., and immediately cooling it in the air. The former method is to be preferred, as it gives the best germination of the barley. It is important in these treatments that the temperature be kept constant during the dipping, and that the cooling be done at once; the latter process is preferably done in the air, rather than by dipping in water.

Wart disease, or black scab, of potatoes (*Jour. Hort., 60 (1908), No. 3136, pp. 457, 458*).—A full description is given of the wart or black-scab disease of potatoes, a previous account of which has been noted (E. S. R., 16, p. 169). The disease, which is due to the fungus *Chrysophlyctis endobiotica*, appears to be spreading in parts of Europe.

For its control, the author recommends the treatment of potatoes immediately after harvest with sulphur, and, as the fungus is propagated in the soil, where a diseased crop has been grown rotation should be adopted. In the case of the 4-course rotation, it should be so arranged as to allow 8 years to intervene before the next planting of potatoes. Treatment of the ground with gas lime early in the spring, after which it is top-worked, has proved efficient in holding the disease in check. When potatoes are to be planted, it is recommended that the cuttings be dusted with sulphur and sulphur spread on the soil during

the progress of planting. Some varieties seem to be less subject to the wart disease than others, and, so far as possible, these should be employed.

The root rots of beets. W. Busse (*Bl. Zuckerrübenbau, 15 (1908), No. 19, pp. 297–300, pl. 1*).—Under the title of root rots are described the root rots of young garden and sugar beets caused by *Pythium debaryanum*, *Phoma betæ*, and *Aphanomyces lævis*. The methods of attack, peculiarities and differences of the diseases, and means of control are discussed.

The heart rot of sugar beets. A. Genty (*Sucr. Indig. et Colon., 71 (1908), No. 25, pp. 685–689*).—A description is given of the heart rot of sugar beets due to *Phoma tabifica* and of the conditions under which the disease is spread. Attention is called to the fact that certain races of beets seem more subject to the disease than others. The distance in planting was also found to exert an important bearing.

As general precautions to be taken for the control of this disease, the author recommends deep plowing early in the winter, at which time stable manure may be plowed in, and the use of large quantities of wood ashes at the rate of 2 to 2½ cubic meters per hectare (about 23 to 29 bu. per acre).

A mold of latouag wheat. L. Mangin and N. Patouillard (*Bul. Trimest. Soc. Mycol. France, 24 (1908), No. 3, pp. 156–164, figs. 4*).—According to the authors, the natives of Algeria preserve their wheat in silos, cavities in the earth, and similar places, in which, on account of the heat and humidity, the grain undergoes a series of fermentations which give special properties to it that are highly relished by the natives. Among the fermented wheats, a number of which are described, is one called latouag. In this case the wheat undergoes special changes by the action of molds, which give to it a decreased nutritive value and communicate to it certain toxic properties.

A study was made of this preparation, and the changed condition was found to be largely due to a fungus, which appears to be thus far undescribed. The authors give a technical description of it under the name *Monilia arnoldi* n. sp.

Bean anthracnose. H. H. Whetzel (*New York Cornell Sta. Bul. 255, pp. 431–447, figs. 6*).—As a result of 3 years' observations and experiments, the author has found it necessary to modify the generally accepted conclusions regarding the control of this disease, as given in Bulletin 239 of the station (E. S. R., 18, p. 51). The present bulletin is largely a criticism of the methods of treatment suggested in the previous publication.

It is claimed that experiments have shown that the benefits to be derived from seed treatment are very insignificant. The selection of clean seed by hand picking, while in some instances resulting in a diminished amount of disease, in general has proved of no value in eradicating or even partially controlling the spot. The removal of diseased seedlings, which is impracticable except in short garden rows, it is believed may be disregarded as a factor in controlling the disease. Spraying with Bordeaux mixture, if exceedingly thoroughly done, is effective in controlling the disease, but under field conditions with the present machinery it is not believed sufficiently advantageous to warrant the expense and trouble. The cultivation or working of beans when the plants are wet should be avoided as much as possible. On this point the author says there can be no dispute. The spores are held together in mass by a sort of mucilage which is dissolved during the time the plants are wet, and at this time any disturbance of the plants scatters the spores to other plants that may not be affected.

In considering methods of control of the disease, the author places most reliance on clean seed. This can be obtained by securing seed from noninfested regions or it may be by the careful selection of the beans in the field, seeing that no spots are to be found on any of the pods. If on careful inspection the pods appear sound, the seed within will not be diseased.

Further investigations are to be carried on on a number of lines with this disease.

Some apple leaf-spot fungi, C. P. HARTLEY (*Science, n. ser., 28 (1908), No. 709, pp. 157–159*).—The author reports studies of leaf spot of apples, in which 15 species of fungi were found present, only 4 being common enough to indicate any economic importance. These were *Coryneum foliicolum*, *Coniothyrium pirina*, an undescribed species of Tuberculariæ, and *Sphæropsis malorum*.

Studies were made with pure cultures of *C. pirina*, and the results of inoculations indicate that it is a facultative or wound parasite only able to produce spots on apple leaves provided it has killed or injured tissues in which to get a start. It probably causes a considerable amount of leaf spot, but this has not yet been demonstrated. The fungus was found to grow readily on dead twigs, and this led to its further study. A morphologically identical species was found on dead twigs of a quince bush, and pure cultures were successfully inoculated on apple leaves, producing the characteristic appearance. Later the fungus was found on dead apple twigs, and it is possible that it winters in this way. The author was unable to find fruits of the fungus on any fallen leaves during the winter or spring.

Inoculation experiments were also made with *C. foliicolum* with similar results, the Coryneum appearing even less actively parasitic than the Coniothyrium.

A leaf-spot fungus of the apple, J. L. SHELDON (*Torreya, 8 (1908), No. 6, pp. 139–141*).—During the past 5 years the author has been making a study of the causes of defoliation in the apple orchards of West Virginia, and during this time has examined hundreds of leaves. As a result he has found that the worst defoliated orchards showed that the fungi hitherto associated with defoliation were either not present or when present did not bring about defoliation. There was, however, a fungus belonging to the family Tuberculariæ universally present in the orchards and so plentiful that the lower branches of some of the trees were nearly defoliated, the remaining leaves being brown and crumpled.

A study of the fungus showed that it was an undescribed species, and the author gives a technical description of it under the name *Illosporium malifoliorum* n. sp. The spots caused by this fungus are said to be different from those caused by any other leaf spot of the apple and can be readily recognized even when the fungus is not in fruiting condition. In general, the spots are nearly circular, from 5 to 15 mm. in diameter, often coalescent. The spots are brown or mottled gray in color, the colors being more or less concentrically arranged. In the center of some of the spots is to be found a small gray or whitish spot, caused usually by the infection of the leaf by some other fungus. The larger and encircling spots are due to a secondary infection by the fungus under consideration.

Apple leaf spot, F. J. CHITTENDEN (*Jour. Roy. Hort. Soc. [London], 33 (1908), No. 2, pp. 500–511, figs. 3*).—A description is given of the blotching and scorching of apple leaves, due to the fungus *Cladosporium herbarum*. This disease is said to have been extremely prevalent during the season of 1907, the weather conditions being such as to cause a somewhat abnormal growth, which rendered the foliage subject to the attack of fungi.

From an investigation of a large number of varieties, the author finds that some varieties are apparently more liable to the attack of this fungus than others. The best method of prevention, so far as known, lies in the checking of the germination of the fungus by means of applications of dilute Bordeaux mixture.

Exoascus deformans, G. Zauli (*Bul. R. Soc. Toscana Ort., 3. scr., 12 (1907), No. 11, pp. 325–327; abs. in Jour. Roy. Hort. Soc. [London], 33 (1908), No. 2, p. 597*).—An account is given of experiments by V. Peglion for the control of *E. deformans* on the peach tree. It is said that this fungus can be successfully controlled by the use of a wash consisting of copper sulphate 2 kg., lime 1 kg., ammonium chlorid 0.2 kg., and water 100 liters. This should be applied before the opening of the buds, and if the season is favorable, a single washing of the trees is sufficient. If, however, the weather should prove rainy, a second application should be made while the trees are still in a dormant condition.

According to the account, a tree treated with this fungicide retained its leaves, whereas others not treated lost all theirs through attacks of the fungus. The treated tree fruited prolifically and the accustomed falling of the fruit did not occur.

American gooseberry mildew (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 3, pp. 479–484, pl. 1, figs. 3*).—A description is presented of the gooseberry mildew due to *Sphærotheca mors-uvæ*, attention is called to its destructive nature, and a warning given against the importing of plants from regions that are known to be infested by the fungus. Where the disease is present, spraying with Bordeaux mixture or some other fungicide and the burning of diseased plants, etc., are recommended.

A brief note is given of the European gooseberry mildew (*Microsphæra grossulariæ*), which is seldom found on the berries, confining its attacks chiefly to the leaves. This mildew, it is said, can be held in check by spraying with a solution of potassium sulphid.

[Some vine diseases], F. T. Bioletti (*California Sta. Bul. 197, pp. 147–158, figs. 12*).—A description is given of the powdery mildew of grapes due to *Oïdium* sp., the Anaheim or California vine disease, brunissure, black knot, and coulure. So far as known, the causes of these diseases are described and methods suggested for the prevention of injury by them.

Notes on grape downy mildew in 1907, H. Faes (*Chron. Agr. Vaud, 21 (1908), Nos. 8, pp. 189–193; 9, pp. 207–212*).—While the mildew was late in appearing during the summer of 1907, the conditions for its development were such that it spread rapidly and proved very destructive. Under the author's directions, experiments were carried on at the viticultural station in combating the disease, and an account is given of the results of the different treatments.

A 2 per cent Bordeaux mixture when applied in sufficient quantity proved efficient in controlling the disease. It was found that it should be applied at the rate of from 40 to 50 gal. per acre at the first spraying and from 75 to 100 gal. per acre for each subsequent application. The sprayings should be made at intervals of 15 days, and for the prevention of the powdery mildew sulphur should be applied at like intervals after the second or third spraying.

During the same summer the author tested the efficiency of combined fungicides when applied in liquid form. Plats of equal extent were sprayed with 1 and 2 per cent Bordeaux mixture, a 1 per cent solution of copper acetate, formalin, Bordeaux mixture neutralized with alkaline polysulphids, and formidol, which is said to be a combination of formic acid and copper. The resulting crops on the different plats were collected, and the yields were decidedly in favor of the Bordeaux mixture and the copper acetate solutions. Bordeaux mixture neutralized with alkaline polysulphids gave a much diminished yield of grapes, and formalin still less, the crop where this fungicide was used being almost an entire failure.

The use of proprietary mixtures for the control of downy and powdery mildew, J. Fischer (*Mitt. Weinbau u. Kellerw., 20 (1908), No. 7, pp. 104–109*).—A series of experiments was conducted to test the value of neutral

copper acetate, azurin, Antiperonosporina, Antiperonospora, Schloesing's Bordeaux mixture, Carat, and Reflorit as compared with Bordeaux mixture for the control of the downy and powdery mildew of the grape.

The author sprayed an equal number of vines with each of the mixtures and later carefully examined each of the stocks and determined the number of infected leaves on the treated plants. One hundred and fifty stocks which had been sprayed with Bordeaux mixture showed only 39 leaves containing downy mildew. None of the other preparations showed as favorable results, and the author concludes that when the cost of the material is considered as well as its efficiency, none of them are in any way to be considered superior to Bordeaux mixture as usually recommended.

Effect of some fungicides on the control of downy mildew, R. Meissner (*Weinbau u. Weinhandel, 26 (1908), No. 43, pp. 387, 388*).—In 1907 experiments were carried on with a number of proprietary fungicides for the control of the downy and powdery mildew of grapes, comparisons being made with Bordeaux mixture and soda Bordeaux. The results obtained showed that for practical purposes 1 to 2 per cent of Bordeaux mixture is the most efficient means for controlling downy mildew and sulphur for combating powdery mildew of the grape.

Two diseases of prickly pears, H. Tryon (*Queensland Agr. Jour., 21 (1908), No. 3, pp. 143–147*).—Descriptions are given of 2 diseases to which the prickly pear is said to be subject in Australia. The first is apparently due to some physiological disturbance, and while it appears at times to destroy parts of the plant and hold its spread in check, it does not seem to be of any great economic importance.

The second of these diseases, to which the name sleeping sickness has been given, is apparently due to a fungus attacking the roots of the plant, but the fungus has not as yet been fully identified. As far as observed, the disease spreads very slowly, and as it is a root disease there is apparently not much prospect of artificially communicating it.

The fir disease in Jura, E. Henry (*Bul. Soc. Sci. Nancy, 3. ser., 8 (1907), No. 3, pp. 361–378, fig. 1*).—Attention is called to the disease of firs attributed to the fungus *Phoma abietina* or *Fusicoccum abietinum*, which has been previously reported by the author (E. S. R., 19, p. 657). In that publication the author expressed doubt as to the fungus proving a serious menace to the forests, but other investigators having claimed that it would prove very destructive, he has investigated the subject anew, and from his personal investigations and testimony received from different regions he concludes that while the fungus is the cause of a disease resulting in the reddening of the foliage of the fir trees, the disease is of relatively little importance and apparently never causes the death of the tree.

A note on Micropera abietis, G. Fron (*Bul. Trimest. Soc. Mycol. France, 24 (1908), No. 3, pp. 169–171, fig. 1*).—A description is given of *M. abietis*, a fungus occurring on fir trees that has not hitherto been reported from France. The author points out some departures from the typical form characterized by Rostrup.

Extent and importance of the white pine blight, S. T. Dana (*U. S. Dept. Agr., Forest Serv. [Pamphlet], 1908, May 26, pp. 4, map 1*).—In the early summer of 1907 inquiries were received from various parts of New England regarding a peculiar blight of the white pine in that section.

Trees affected by the blight are readily recognized from the characteristic reddish-brown color assumed by the newest needles. The tip of the needle is always affected first, and the extent of the discoloration varies greatly in different needles and in different trees. Attacked trees look as though they had

been scorched by fire. As the needles of the white pine fall after 2 years, in case the newer ones are affected the trees become more or less defoliated.

This disease is now widely distributed throughout the central and southern parts of New England and occurs also in New York, New Jersey, and Pennsylvania. It has thus far caused but little damage, but if it proves to be infectious it may produce serious results. The cause of the trouble is unknown.

The blight on chestnut trees, J. MICKLEBOROUGH (*Conservation, 14 (1908), No. 11, pp. 585–588, figs. 2*).—An account of the occurrence and distribution of the blight of chestnut trees due to the fungus *Diaporthe parasitica*. The fungus has already caused the destruction of nearly all the chestnut trees in Prospect Park, Brooklyn, and is spreading rapidly in a number of other localities.

Extent and importance of the chestnut bark disease, E. R. HODSON (*U. S. Dept. Agr., Forest Serv. [Pamphlet], 1908, Oct. 21, pp. 8*).—A description is given of the chestnut bark disease due to *Diaporthe parasitica*, or *Valsonectria parasitica*, as it is sometimes called, previous accounts of which have been given (E. S. R., 19, pp. 250, 1051, 1154).

A disease of the Cineraria, F. J. CHITTENDEN (*Jour. Roy. Hort. Soc. [London], 33 (1908), No. 2, pp. 511–513, figs. 2*).—A report is given of a disease of Cineraria leaves, due to the fungus *Colcosporium senecionis*, which, in view of the fact that the fungus occurs on a large number of weeds, may prove quite troublesome.

Upon the Cineraria the attack is characterized by the appearance on the under surface of the leaves of orange-yellow, waxy-looking patches, covering areas varying from 0.25 in. in diameter to almost the whole surface of the leaf. As the disease spreads, the upper surface of the leaves becomes blackish in color. The yellow patches appear in September, and the yellow color is due to uredospores. Later these patches become red and bear the winter spores.

The injury to the plant arises from the fact that considerable nourishment is withdrawn by the fungus, and the plant also suffers by the disfiguring of the leaves.

The attacks of the fungus may be prevented by spraying with a solution of permanganate of potash.

The occurrence of Rhodochytrium spilanthidis in North America, G. F. ATKINSON (*Bot. Gaz., 46 (1908), No. 4, pp. 299–301; Science, n. ser., 28 (1908), No. 724, pp. 691, 692*).—The occurrence of the parasitic alga *R. spilanthidis* on the leaves of the ragweed (*Ambrosia artemisiæfolia*) in North Carolina is reported.

The parasite is an alga devoid of chlorophyll, and attacks the leaves, stems, pedicels, flower bracts, and other parts of the host plant. It begins its development in early summer on the small seedlings and by succeeding crops of zoospores continues the infection of these plants throughout the season, until finally the flower racemes are affected. The parasite has a reddish yellow oil deposited in the protoplasm, and this is so massed in the larger sporangia that it causes a bright red color visible through the thin layer of the cortical tissue. The plant is always located in or adjacent to the vascular bundles, and there is an extensive system of mycelial rhizoids which are profusely branched.

This parasite was first discovered in North Carolina by Dr. F. L. Stevens, who referred material to the author. Since the first collection was made in August, 1903, it has occurred in abundance every year, and 14 additional stations were reported in 1908. In many cases the ragweed is so affected that the destruction can be recognized from car windows.

Bordeaux mixture and other fungicides, G. QUINN (*Jour. Dept. Agr. So. Aust., 12 (1908), No. 2, pp. 146–149*).—Formulas are given for the preparation

of Bordeaux mixture, a new Bordeaux mixture made according to a formula in use at the Woburn Experimental Fruit Farm, and Burgundy mixture.

The new Bordeaux mixture is made by slaking 3 lbs. of quicklime in about 100 gal. of water and then adding 86 gal. of this clear solution to 14 gal. of water in which 6 lbs. 6½ oz. of copper sulphate has been dissolved. This will yield 100 gal. of a clear Bordeaux mixture that is said to be superior to and cheaper than that made according to the commonly accepted formulas.

Fungicides, H. H. Whetzel (*New York Cornell Sta. Circ. 2, pp. 9–16*).—Directions are given for the preparation of most of the common fungicides now in use, together with lists of the more common diseases which careful experiments have shown to be effectively controlled by the use of the fungicides.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Harmful and beneficial mammals of the arid interior, with special reference to the Carson and Humboldt valleys, Nevada, V. Bailey (*U. S. Dept. Agr., Farmers' Bul. 335, pp. 31, figs. 9*).—Among the problems to be solved by the settlers of the areas of western Nevada now being reclaimed and brought under cultivation are those connected with the present and prospective relation of the native mammals to agriculture. Farm crops, trees, live stock, poultry, and ditch banks suffer from the depredations of certain species. In indiscriminate retaliation on the part of the settler many beneficial animals are unwittingly destroyed.

In this bulletin is found an account of the animals of this region of economic importance accompanied by directions for their destruction or protection as the case may be. The following species are described as more or less injurious: Piute ground squirrel (*Citellus mollis*), antelope squirrel (*Ammospermophilus leucurus*), sagebrush chipmunk (*Eutamias pictus*), Carson meadow mouse (*Microtus montanus*), muskrat (*Fiber zibethicus*), Sonoran white-footed mouse (*Peromyscus sonoriensis*), cliff mouse (*P. crinitus*), large-eared mouse (*P. truei*), desert harvest mouse (*Reithrodontomys megalotis deserti*), house mouse (*Mus musculus*), common or brown rat (*M. norvegicus*), desert wood rat (*Neotoma desertorum*), Nevada pocket gopher (*Thomomys nevadensis*), sagebrush pocket gopher (*T. fisheri*), kangaroo mouse (*Microdipodops pallidus*), desert kangaroo rat (*Dipodomys deserti*), black-tailed jack rabbit (*Lepus desertícola*), cottontail (*L. nuttalli*), bobcat (*Lynx baileyi*), and coyote (*Canis lestes*). The short-tailed grasshopper mouse (*Onychomys brevicaudus*), desert fox (*Vulpes macrotis*), large skunk (*Mephitis major*), little spotted skunk (*Spilogale saxatilis*), badger (*Taxidea americana*), Arizona weasel (*Putorius arizonensis*), mink, otter, and bats are considered as mainly beneficial.

Game laws for 1908, T. S. Palmer and H. Oldys (*U. S. Dept. Agr., Farmers' Bul. 336, pp. 55, maps 4*).—This includes the essential features of changes in the game laws made during 1908. Data concerning the closed seasons for game in the United States and Canada, and laws relative to the export and sale of game, and the limits fixed for its capture have been brought together under State, Territory, and province headings. Details concerning hunting licenses and export regulations are shown in tabular form.

Distribution and control of wild rabbits in Mecklenburg, K. Friedericus (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 3, pp. 161–196, pls. 2, figs. 2*).—During recent years wild rabbits have greatly multiplied in Mecklenburg and have caused a large amount of damage to vegetation of all sorts, particularly young shrubbery. In the year 1906–7, nearly 7,000 rabbits were killed by forest inspectors. Other means of control suggested by the author include the use of repellant substances on trees likely to be attacked or rabbit-proof wire fencing.

The author gives an account of the natural enemies of rabbits, including foxes, wild cats, weasels, and parasitic insects and worms. The most important means of controlling rabbits are to be found in the extensive use of traps, fumigation, and distributing poison.

The destruction of rats. B. GALLI-VALERIO (*Chron. Agr. Vaud, 21 (1908), No. 6, pp. 142–147*).—The damages caused by *Mus rattus* and *M. decumanus* are briefly described. These rats must also be considered as likely to carry various pathogenic bacteria and parasites from place to place. A rat virus was used but later was abandoned as being less effecitve than traps and other means of destruction.

The use of fluid cultures of mouse typhoid (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 6 (1908), No. 3, pp. 33–35*).—The effect of cultures of mouse typhoid bacilli is not to be observed until after 8 to 14 days. As a rule, the mice dead from this cause are not to be found on the surface of the ground, since they hide in their burrows before dying.

The ecological succession of birds, C. C. ADAMS (*Auk, 25 (1908), No. 2, pp. 109–153*).—A review is given of the more important literature on habitats and the succession of birds observed in various localities. Particular attention is given to the various associations or communities of birds which may be observed in one and the same localities at different seasons of the year. It is believed that a more complete knowledge of these matters will be of importance in gaining definite information as to the economic relations of birds.

The significance of insectivorous birds in agriculture, J. R. BOS (*Tijdschr. Plantenziekten, 12 (1906), No. 4–6, pp. 105–142*).—A general discussion is presented of the relationship of insectivorous birds to agriculture. Attention is given to the problems of determining the economic relations of various species of insects and of estimating the value or injurious character of birds which feed indiscriminately upon harmful and beneficial insects.

Proceedings of the twentieth annual meeting of the Association of Economic Entomologists (*Jour. Econ. Ent., 1 (1908), No. 2, pp. 81–159, figs. 4*).—A continuation of the proceedings of the association at the 1907 meeting (E. S. R., 20, p. 252). Brief notes are given on the various papers in the following paragraphs.

S. A. Forbes presented the results of Experiments with Repellents Against the Corn Root-Aphis. Seed corn was soaked in kerosene at the rate of a teaspoonful to 4 qts. of corn, in a 10 per cent alcoholic solution of oil of lemon, and in a 3 per cent solution of carbolic acid or formalin. As a result of these treatments the reduction in the number of aphids was 14 per cent after carbolic acid, 60 per cent after formalin, 84 per cent after kerosene, and 89 per cent after oil of lemon. The gain in the number of ears was about 20 per cent where the oil of lemon was used.

E. P. Taylor discussed the Life History and Control of the Green-Peach Aphis. In the author's opinion, *Myzus persicæ* has been confused with other species. The life history of this insect is presented in considerable detail. The insect may be controlled by the use of 5 per cent emulsion of kerosene in the spring.

W. E. Hinds and F. C. Bishopp presented A Key for the Classification of Entomological Records. This key contains a detailed outline of subject headings under which the records of entomological work and study and projects to be investigated may be suitably classified.

E. F. Phillips called attention to the desirability of a more thorough study of bee diseases. The men who have been selected as inspectors of apiaries have not always succeeded in controlling the spread of foul brood and other bee diseases. T. B. Symons reported a test of carrying on public spraying with charges merely covering the cost and general expenses. The results were quite

satisfactory. W. E. Britton gave an account of experiments with gases for fumigating nursery trees, already noted from another source (E. S. R., 19, p. 1053).

W. Newell and T. C. Paulsen outlined some results obtained in spraying experiments to destroy the foliage of cotton in the fall. In these experiments common salt, bicarbonate of soda, lye, hydrochloric acid, white arsenic, iron sulphate, and other materials were used. The iron sulphate gave quite satisfactory results. Some growth takes place after defoliation, but this is not regarded as a serious matter.

W. D. Pierce discussed The Economic Bearing of the Study of Parasites of the Cotton-Boll Weevil. It is suggested that cultural operations can be so organized as not to interfere with the hibernation or multiplication of the parasites of the weevil. C. T. Brues called attention to The Correlation Between Habits and Structural Characters Among Parasitic Hymenoptera. Some species of hymenopterous parasites show a very limited range of hosts, while others adapt themselves to a greater number of hosts. The latter are on the whole more decidedly dominant species.

E. D. Sanderson gave some of the results of a study of the codling moth in New Hampshire. It is estimated that 88 per cent or more of the total benefit of spraying was due to the effect on the first brood and through it on the second brood. It is believed that in New England the first brood may be controlled by spraying when the petals drop. F. L. Washburn described the process of Egg Laying of *Empoasca mali*. Notes on Some Insects of the Season were given by H. Osborn for Ohio, G. P. Welden for Maryland, E. P. Felt for New York, and W. Newell and A. H. Rosenfeld for Louisiana.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Wash., 9 (1907), No. 1–4, pp. 164, pls. 7, figs. 9*).—At the meetings of the society, reports of which are included in this number of the proceedings, papers were read on various entomological subjects, some of which are of considerable economic importance. Among these papers mention may be made of the following:

Notes on Insect Enemies of Wood-boring Coleoptera, by W. F. Fiske; A Gallmaker of the Family Agromyzidæ, by F. D. Couden; A Preliminary Review of the Classification of the Order Strepsiptera, by W. D. Pierce; The Fashioning of the Pupal Envelope in *Lysiphlebus tritici*, by F. M. Webster; and A New Buprestid Enemy of *Pinus edulis*, by H. E. Burke.

Some features of the work of the State board of entomology. R. I. Smith (*Ga. Bd. Ent. Bul. 25, pp. 144–153*).—A historical statement is presented of the origin and work of the Georgia State Board of Entomology, particular attention being given to experiments on woolly aphis, green aphis of the apple, San José scale, fungus disease of the San José scale, and spraying for peach curculio.

Twenty enemies of agriculture. E. Hnos (*Estac. Agr. Expl, Ciudad Juárez, Chihuahua, Bol. 11, pp. 47*).—Economic and biological notes are presented on sheep bot flies, horse bot flies, cattle ticks, sheep ticks, grasshoppers, codling moth, fall webworm, cabbage aphis, tomato worms, bean ladybird, fleas, squash bugs, boll weevil, and other pests.

Injurious insects and their destruction. L. de Malafosse (*Jour. Agr. Prat. Vit. et Econ. Rurale Midi France, 103 (1907), No. 16, pp. 429–444*).—A popular account is presented of the extent of destruction caused by injurious insects and on practical means of combating them. Attention is particularly called to grain weevils, elm-leaf beetle, various other shade-tree insects, locusts, and flies and other insects that are concerned in the transmission of infectious diseases.

Entomological notes, C. Fuller (*Natal Agr. Jour., 11 (1908), No. 2, pp. 191–196*).—Brief notes are given on army worms, fruit-fly parasites, and San José scale.

Description of insects and their work. Insecticides, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 5 (1908), No. 12, pp. 361–424*).—Descriptive notes are given together with remedies for the common insect pests of fruits, garden crops, live stock, and household articles.

Notes on insect pests (*Jour. Bd. Agr. [London], 15 (1908), No. 1, pp. 45–47*).—In combating cockroaches good results should be expected from the use of pyrethrum, poisoned baits, and traps. Brief statements are made regarding the habits and means of combating celworms, springtails, mites on gooseberries, and Otiorhynchus.

Life histories and larval habits of the tiger beetles, V. E. Shelford (*Jour. Linn. Soc. [London], Zool., 30 (1908), No. 197, pp. 157–184, pls. 4*).—The author discusses suitable methods for rearing and studying larvæ of tiger beetles. Detailed notes are given on the life history of *Cicindela purpurea*, *C. formosa*, *C. hirticollis*, and other species. The eggs are laid in the spring or midsummer according to the species. The larvæ hibernate in the second or third stage of development and pupate the following June or during the second summer. The interval between generations in most species is two years. Observations were made on the influence of varying conditions of temperature, moisture, and food upon the development of tiger beetles.

The gum-lac insect of Madagascar, and other coccids affecting the citrus and tobacco in that island, R. Newstead (*Liverpool Univ., Inst. Com. Research Trop. Quart. Jour., 3 (1908), No. 6, pp. 3–14, figs. 22*).—A detailed description is given of *Gascardia madagascariensis*, *Lecanium nicotianæ*, and *Aleurodes voeltzkowi*, the latter two being described as new species, and also of a number of other scale insects observed in Egypt.

On a new genus of Ixodoidea together with a description of eleven new species of ticks, G. H. F. Nuttall and C. Warburton (*Proc. Cambridge Phil. Soc., 14 (1907), No. 4, pp. 392–416, figs. 45*).—Definitions are given of the anatomical terms used in the descriptions of ticks. The new species described by the author belonged to the genera Ixodes, Hæmaphysalis, Rhipicephalus, Amblyomma, Hyalomma, and Rhipicentor, the last genus being described as new.

An agricultural pest in Porto Rico, Bouvier (*Bul. Soc. Nat. Agr. France, 67 (1907), No. 9, pp. 820–825*).—An account is given of the habits and life history of *Scapteriscus didactylus*, known in Porto Rico as changa, with instances of the injury caused by this insect to various crops.

Phalacrus corruscus as an enemy of cereal smuts, K. Friederichs (*Arb. K. Biol. Anst. Land u. Forstw., 6 (1908), No. 1, pp. 38–52, pl. 1*).—*Phalacrus corruscus* has been found to exert an important influence in destroying the smuts of cereals. The larvæ of this insect have been found generally distributed in infected ears of grain in cases of wheat smut, loose smut of oats, and barley smut. A single infected kernel of grain may contain from 1 to 3 larvæ. The eggs are laid on the stem near the head of the grain or in the head near infested kernels. The larvæ feed upon the smut spores during their whole development and as soon as the mature size is reached they leave the plants and bury in the ground. An examination of fields infected with smut showed that nearly every infected head of grain contained several larvæ, sometimes more than a dozen. The insect in question is, therefore, considered as being of great importance in the control of smuts. The author found that the spores are all rendered incapable of germination by passing through the body of the larvæ,

Erroneous reports of cotton-boll weevil—its present status, F. SHERMAN, Jr. (*N. C. Dept. Agr. Ent. Circ. 21, pp. 4*).—Reports to the effect that the cotton-boll weevil has been found in North Carolina are declared to be without foundation. At present this insect occurs in eastern Texas, Oklahoma, Arkansas, Louisiana, and Mississippi.

Insect pests and diseases of sugar beets in 1907, O. FALLADA (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Österr.-Ungar., No. 197, pp. 28–37*).—Brief accounts are given on the injuries caused to sugar beets by mole crickets, wireworms, snout beetles, flea beetles, red spiders, cutworms, plant lice, root worms, nematodes, and other insect pests. Mention is also made of losses caused by the occurrence of dry rot, scab, bacteriosis, and other fungus diseases.

Fumigation for the citrus white fly, as adapted to Florida conditions, A. W. MORRILL (*U. S. Dept. Agr., Bur. Ent. Bul. 76, pp. 73, pls. 7, figs. 11*).—Fumigation experiments with hydrocyanic-acid gas carried on in Florida for two winters, during the short dormant period (December, January, and February), when there were no winged insects, have demonstrated the practicability of this method for the control of the white fly. In an extended discussion of the conditions favoring or necessary to good results, the author considers the isolation of the grove, the importance of concerted action, the absence or elimination of food plants other than citrus, the season of the year, meteorological conditions, and the size of trees and their regularity of setting. It was found that fumigation could safely begin at sundown and that on cloudy days it was safe to fumigate at any time with untreated tents. The effect of wind was found to be so great that fumigation is not recommended when more than a slight breeze prevails. It is concluded that moisture on the leaves in the form of dew does not reduce the efficacy of the gas in destroying the insects but possibly increases it.

The many details relating to the equipment and methods of operation including quality and amount of the chemicals, tents and methods of handling, measuring trees, methods of generating the gas, estimation of time required for fumigation of the grove, and methods of computing approximate dimensions and cubic contents are discussed. The bell or hoop tent and the sheet tent are the two styles now in use.

A formula of 1 part potassium cyanid, 1 part sulphuric acid, and 3 parts water and an exposure of 40 or 45 minutes is recommended. Elaborate tables are given which show the results obtained from various sized trees at various strengths of gas. When the recommendations here made are followed, appreciable injury to orange trees will rarely occur and apparently never to tangerine and grapefruit trees. As occasional injury to the fruit may occur, it is thought best to pick the crop before starting to fumigate. The author recommends particularly the taking up of fumigation by the various counties under the direction of their horticultural commissioners. The Florida red scale (*Chrysomphalus ficus*) and the purple scale (*Lepidosaphes beckii*), two pests of citrus fruit are controlled by the fumigation for the white fly.

The entire cost of fumigating a tree measuring 42 ft. over the top from ground to ground and 59 ft. in circumference is estimated at 50 cents. It is further estimated that in 2 years the cost of spraying a tree of this size would double the cost of one fumigation. "In a series of 5 or more years spraying would doubtless cost fully 3 times as much as would control by fumigation, the labor involved would be far greater, and the results far less satisfactory. . . . Manatee County is the only large orange-growing district where the fungus diseases have proved of much assistance. . . . One year in three, it is the

experience of the growers in this county, the fungi have so thoroughly cleaned up the pest that the fruit is clean and requires no washing. . . . The writer's observations lead to the conclusion that in 90 per cent of the groves in those localities where the fungus diseases are most effective, for every dollar expended for well-conducted fumigation the profits from the groves will be increased not less than $4, or at the rate of 250 per cent on the investment. . . . The spores and mycelium of the fungi are not affected by fumigation, as far as has been determined thus far." A dosage table is appended.

Fungus diseases of scale insects and white fly, P. H. Rolfs and H. S. Fawcett (*Florida Sta. Bul. 94, pp. 5–17, figs. 20*).—Descriptions are given of species of fungi that have been found of economic importance in combating various scale insects and the white fly, which are troublesome in Florida on citrus trees. The fungi described are *Sphærostilbe coccophila*, *Ophionectria coccicola*, and *Myriangium duriæi*, which attack various species of scale insects, and *Aschersonia flavo-citrina*, *A. aleyrodis*, and an undetermined species of fungus, the spore-bearing stage of which is not known, which attack the white fly.

Methods for applying the fungi to infested trees are described, these consisting for the most part in fastening twigs or leaves carrying the fungus to infested trees. In the case of the red fungus of the white fly (*A. aleyrodis*), it has been found that this can be readily disseminated by spraying the spores directly on trees. Where this method is employed, a dozen or more leaves bearing abundant pustules of the fungus should be placed in a pail of water, stirred, and allowed to stand for 15 to 30 minutes. The mixture thoroughly stirred is then sprayed over the tree, care being taken not to use machinery that has been employed in the application of fungicides or insecticides.

In order that the introduction of these fungi should be effective, it is suggested that close observation be made of the entire orchard and that wherever the greatest amount of the scales or white flies are located the fungi be introduced in such position as to give the best opportunity for the spores to spread from one limb to another and from tree to tree.

The San José scale, E. D. Sanderson (*New Hampshire Sta. Circ. 5, pp. 12, pl. 1, figs. 5*).—A general account of this pest, including its life history, spread and means of spreading, food plants and remedies. It is stated that during the past 2 years a number of bad infestations covering several neighboring orchards have been reported.

The oyster-shell scale (*New Hampshire Sta. Circ. 4, pp. 4, figs. 3*).—Young apple and poplar trees are reported to have been killed by this insect, which has been found exceedingly abundant in young orchards of southern New Hampshire. Spraying as the young are crawling about in late May and early June with a 15 per cent kerosene emulsion or whale-oil soap at the rate of 1 lb. to 4 or 5 gal. of water is recommended. The whale-oil soap may be added to Bordeaux mixture if the latter is being used early in June.

Caterpillars injuring apple foliage in late summer, E. D. Sanderson (*New Hampshire Sta. Bul. 139, pp. 207–228, figs. 13*).—An account of the life histories and habits of the fall webworm, yellow-necked apple caterpillar (*Datana ministra*), red-humped apple caterpillar (*Schizura concinna*), hickory tiger moth (*Halisidota caryæ*), rusty tussock moth (*Notolophus antiqua*), and the white marked tussock moth (*Hemerocampa leucostigma*). As most of these caterpillars are injurious late in the summer, spraying about August 1 with Paris green or arsenate of lead is advised, the Paris green to be used 1 lb. to 100 gal. of water to which 1 or 2 lbs. of freshly slaked stone lime should be added, and the arsenate of lead to be used at the rate of 3 to 5 lbs. to 50 gal. of water. Spraying apparatus is also briefly discussed.

The apple leaf-aphis, E. D. SANDERSON (*New Hampshire Sta. Circ. 3, pp. 6, figs. 4*).—This pest is reported to have been quite abundant throughout the State during the season of 1908 and in some instances quite seriously injurious to young orchards. A brief account of its life cycle is given. The application of contact sprays in the spring before the aphids have become numerous enough to curl the foliage and thus be protected is recommended.

"A spray of 10 or 15 per cent kerosene emulsion; whale oil or fish oil soap, 1 lb. to 5 gal. of water; tobacco water, or any of the prepared tobacco extracts will kill the aphids if applied so as to hit them. . . . Winter spraying with lime-sulphur mixture as used for the San José scale will kill many of the eggs, but it is doubtful if it will entirely destroy them."

The gall and root forms of phylloxera, ANNA FOA and R. GRANDORI (*Atti R. Accad. Lincei Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), 1, No. 5, pp. 276–281*).—Detailed anatomical notes are given on the differences observed in various structures of these two forms of phylloxera.

Grape culture in California: Its difficulties; phylloxera and resistant vines, F. T. BIOLETTI (*California Sta. Bul. 197, pp. 115–147, figs. 12*).—"California produces, approximately, all the raisins, three-quarters of the wine, and a large share of the shipping grapes of the United States. . . . At present there are over 200,000 acres of vineyard in the State, and the prospects of continued expansion are favorable. . . . The phylloxera is well established now in nearly every large grape-growing section except those of southern California. There are still large areas of vineyard, however, in the San Joaquin and Sacramento valleys which have thus far escaped the pest."

The most plausible theory advanced to account for the slow extension of phylloxera is said to be that the winged form is absent or extremely rare in the interior of the State, no record existing of winged individuals having been found except in the coast valleys.

For the disinfection of cuttings the use of carbon bisulphid is advised. "For the disinfection of rooted vines dipping in hot water is recommended by the best European authorities. The roots should remain in water at 125 to 130° F. for 10 minutes. . . . It is probable that disinfection by means of hydrocyanic gas as practiced for nursery stock would be effective, but data is lacking on this point. . . . Cultivation is one of the most effective means of carrying the root insects from one part of the vineyard to another. Every effort should be made to discourage the introduction of cuttings, and especially of roots, from infested to uninfested districts."

It is estimated that nine-tenths of the resistant vines being planted in California at the present time are Rupestris St. George. While a most excellent stock for a large portion of the country, numerous cases of partial failure have been noted. Experiments made with various stocks and the experience of growers in relation to resistance are reported.

"For a great majority of our soils and varieties the two Riparia × Rupestris hybrids 3306 and 3309 promise to be superior in every way to the St. George. The former for the moister soils and the latter for the drier. . . . In places where the water stands for many weeks during the winter, or where the bottom water rises too near the surface during the summer, the most promising stock is Solonis × Riparia 1616."

A brief description of resistant stocks adapted largely from Les Vignes Américaines, by P. Viala and L. Ravaz (E. S. R., 15, p. 585), is given, accompanied by reproductions of original photographs.

The grape leaf-hopper, H. J. QUAYLE (*California Sta. Bul. 198, pp. 177–219, figs. 23*).—With the exception of the phylloxera, *Typhlocyba comes* is considered the most destructive insect pest of the vine in California. It is found

in practically all of the vine-growing sections, but is most injurious in the Sacramento and San Joaquin valleys. Another species (*Tettegonia atropunctata*) is frequently injurious in the coast valleys.

"The hoppers pass the winter as adult insects on a wide range of food plants that may be growing in the vineyard or vicinity.

"They attack the vine as soon as the foliage appears, and here they remain until the leaves fall in the autumn.

"One month after they begin feeding on the vine, the overwintering hoppers begin egg laying, which is continued over a period of a month or two, after which they die. The hoppers of the spring brood arising from eggs laid in May, become full grown in 3 weeks, begin egg laying 2 or 3 weeks later, and die off in August or September, making the life of this spring brood approximately 3 or 4 months. Hoppers arising from eggs laid by the spring brood in June and later, remain on the vine until the leaves fall in autumn. They then take to whatever succulent vegetation may be present in the neighborhood, where they live over winter and attack the vines again in the following spring. These begin depositing eggs a month after the leaves appear on the vine, and die off in midsummer, making the length of this life cycle approximately 1 year in the central valleys of California.

"The most satisfactory control method tried during the past 2 years was the use of the screen cage. This was found to capture about 85 to 95 per cent of the adult hoppers at a time in the spring before any eggs are deposited.

"Spraying for the nymphs about June 1, or just before the spring brood becomes mature, will kill a satisfactory percentage of the nymphs or young, but will not kill many adults, or prevent eggs, which are present at this time, from hatching later. . . .

"Plowing or other farm practices can not be relied upon, but when such measures are generally practiced throughout a neighborhood, they may aid in reducing the numbers somewhat."

A bibliographical list is appended.

The California grape root-worm, H. J. QUAYLE (*California Sta. Bul. 195, pp. 26, figs. 18*).—*Adoxus obscurus* has been a destructive enemy of the vine in Europe for many years, but while known to attack the leaves of the grape in California for a number of years only with the past year or two has it been known as a root feeder. As the life history and habits of this species are almost identical with the grape root-worm (*Fidia viticida*) of the Eastern States and since it is a great pest only in California, the common name "California grape root-worm" has been applied.

From June to May the insect is in its larval and pupal stages under ground, while during May and June it works on the parts of the vine above ground as a beetle. The eggs are laid in clusters of from 4 to 30 usually in crevices between the inner layers of the bark on old wood, as many as 79 eggs having been obtained from a single female. In breeding experiments eggs hatched in from 8 to 12 days. Upon emerging the larvæ make their way into the ground almost immediately, where they commence feeding, usually upon smaller rootlets at first which may be eaten entirely off. The larger roots are injured by their gouging out long strips of bark, and in cases of severe injury all the bark may be eaten away. Feeding is continued from the time they hatch in the spring until the vine becomes dormant in the fall. Some of the larvæ were found nearly full grown by September 1, while others were only half grown, the latter completing their growth in the spring. The larvæ were found as far down as 2½ ft. The full-grown larvæ which winter over in the ground change to pupæ in the early spring, ascending to within 4 to 8 in. of the surface before pupating. Two weeks are required for development in the pupal stage.

Upon emerging the adult beetles begin to attack growing parts of the vine above the ground, sometimes the framework of the leaf tissues being left, making a skeletonized effect, though often the entire substance is eaten away. The beetle also gouges out strips of bark of the tender shoots in the same manner that it works on the leaves. The berry itself does not escape attacks, as in July berries may be seen that are quite open or gouged out on one side and the growth interfered with as a result of attacks of these beetles in May or June. The beetles may continue to feed for a month or more. After feeding a couple of weeks egg laying commences.

As the pupæ are found at a depth of 4 to 8 in. below the surface and as any disturbance of the cell in which they are resting will generally prove fatal, many may be destroyed by deep cultivation for a radius of 2 to 3 ft. about the base of the vine. In experiments beetles were killed in from 2 to 3 days on leaves sprayed with lead arsenate in the strength of 5 lbs. to 50 gal. of water. One lb. of Paris green to 75 gal. of water also gave good results. The spraying should be done during the last of April or the first of May and applied mostly from above, as it is on the upper surface of the leaves and the shoots that most of the feeding is done. As the beetles are very readily jarred from the vine into crude petroleum or otherwise captured, this offers one of the most satisfactory means of control. A vine-hopper cage that has been used successfully in one locality is described. A bibliography is appended.

The effect of sulphur in vineyards upon earwigs and spiders, E. Molz (*Mitt. Weinbau u. Kellerw., 20 (1908), Nos. 1, pp. 4–9; 2, pp. 24–29*).—The repeated use of sulphur in vineyards destroys a considerable percentage of the earwigs. The sulphur is not poisonous to these insects but causes death by stopping up the tracheal system. Moreover the oxidation products of sulphur act as strong repellants in driving away earwigs. Sulphur appears to have no effect upon spiders.

Biological studies on bark beetles, C. Hennings (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 4, pp. 209–229*).—The author presents biological and economic notes on a number of important beetles including *Hylesinus crenatus*, *H. fraxini*, *Ips typographus*, *I. acuminatus*, and *I. curvidens*.

On some Assam Sal (Shorea robusta) insect pests, E. P. Stebbing ([*Indian*], *Forest Bul. 11, pp. III+66, pls. 8*).—The insect pests of *Shorea robusta* are discussed in detail, the pests being classified according to the part of the tree to which they do damage. In the case of each forest pest, notes are also given on their predaceous and parasitic enemies. The more important species considered in the bulletin are *Hoplocrambyx spinicornis*, *Dialages pauper*, *Phlæosinus major*, and species of Xyleborus, Tomicus, Gryllus, and Lymantria.

The development of diptera in the brood chambers of Myelophilus piniperda, R. Kleine (*Berlin. Ent. Ztschr., 52 (1907), No. 2, pp. 109–113*).—*Myelophilus piniperda* is a beetle which makes its burrows between the bark and the cambium of weakened specimens of *Pinus sylvestris*. In studying the injuries caused by this insect the author found that at least 3 species of flies quite commonly breed in these galleries. These species are *Medeterus obscurus*, *Sciara analis*, and *Lonchæa vaginalis*. It is not determined whether these flies live in a parasitic or some other relation to the beetle.

Chionaspis euonymi, L. Faucheron (*Bul. Mens. Soc. Cent. Agr. Hort. et Acclim. Nice, 48 (1908), No. 3, pp. 75–78*).—The Japanese euonymus is badly infested with *Chionaspis euonymi*. A brief account is given of the life history of this insect and suitable insecticide treatment is recommended.

Injury to Ampelopsis quinquefolia by Spilosoma lupricipeda, E. Molz (*Ztschr. Pflanzenkrank., 18 (1908), No. 2, pp. 92–94, figs. 2*).—The author observed that the Virginia creeper is frequently injured to a serious extent by the

attacks of the caterpillars of *Spilosoma lupricipeda*. This insect feeds upon the smaller stems causing the parts above the injury to turn brown and wilt.

Nurseries and nursery inspection, T. B. Symons, J. B. S. Norton, and C. P. Close (*Maryland Sta. Bul. 130, pp. 79–128*).—A general account in which the authors consider selection and care of the nursery, soil and cultural methods, isolation from scale and yellows, importance of selecting buds and scions, growing low-headed trees, control of injurious insect and plant diseases with formulas for insecticides and fungicides, marketing of nursery stock, and the various State laws regarding inspection. Among the insects briefly discussed are the San José scale, woolly aphis, black peach aphis, green aphis of the apple, oyster-shell scale, scurfy scale, and caterpillars. Plant diseases are considered under the headings of leaf diseases, diseases of the wood, root troubles, and nursery sanitation.

The insect pest law, G. W. Herrick (*Mississippi Sta. Circ., June, 1908, pp. 7, fig. 1*).—The inspection law enacted by the legislature in 1908 is here given and explained. This law empowers the entomologist of the experiment station to promulgate such rules and regulations in regard to the inspection, transportation, and sale of nursery stock as he may deem necessary and also to make and enforce rules and regulations regarding the boll weevil. The rules and regulations governing the transportation of cotton seed in the State are given.

Comparative study of the value of various insecticides for the destruction of caterpillars, A. Truelle (*Jour. Agr. Prat., n. ser., 15 (1908), No. 18, pp. 565, 566*).—With regard to the effectiveness and intensity of action of various insecticides used without emulsion, tobacco powder was found to stand at the head of the list, followed by pyrethrum, Paris green, and various other insecticides, while hellebore was least effective. In emulsion, kerosene proved to be most effective and hellebore least so.

An apparatus for the preparation of kerosene emulsion, L. P. de Bussy (*Meded. Deli-Proefstat. Medan, 2 (1908), No. 3, pp. 237–240*).—Kerosene emulsion has recently been quite widely used in Deli as a contact insecticide for the control of thrips, plant lice, Capsidæ, and other pests. For use on sugar cane the author recommends an emulsion containing 1 part hard soap, 10 parts water, and 20 parts kerosene, the stock mixture to be diluted with 15 parts of water before using.

The etiology of so-called foul brood of bees, A. Maassen (*Arb. K. Biol. Anst. Land u. Forstw., 6 (1908), No. 1, pp. 53–79, pls. 2*).—In the opinion of the author foul brood is not a simple disease but should be considered as an affection of the alimentary tract of bee larvæ due to 3 micro-organisms (*Bacillus alvei, B. brandenburgiensis*, and *Streptococcus apis*). *B. alvei* and *S. apis* occur in both forms of foul brood, while *B. brandenburgiensis* is found only in the malignant form of foul brood in which the cells remain covered. Detailed notes are given on the growth and behavior of these organisms on various nutrient media. The author studied *B. larvæ* obtained from America and came to the conclusion that it is identical with *B. brandenburgiensis*.

FOODS—HUMAN NUTRITION.

A preliminary study of the effects of cold storage on eggs, quail, and chickens, H. W. Wiley et al. (*U. S. Dept. Agr., Bur. Chem. Bul. 115, pp. 117, pls. 13*).—In this extended study of cold storage and its effects information gathered from cold storage warehousemen is summarized, the results of investigations on the effects of cold storage on eggs, quail, and chickens are reported, and data regarding legislative enactments on the subject are given.

The investigations include chemical, bacteriological, histological, and macroscopical examinations with respect to eggs and chickens, and organoleptic tests and a bacteriological examination of quail.

The authors conclude from their investigations that "eggs in storage for one year show a loss of weight equivalent to 10 per cent of the total weight, which loss is largely water from the whites. Eggs after storage for 16.5 months lose their power of cohesion and emit a characteristic musty odor a few hours after opening. A lowering of the amount of coagulable proteid of the boiled sample is indicated, as well as a change in reaction and a lower percentage of lecithin phosphorus in the storage eggs. An increase in the lower nitrogen bodies, proteoses and peptones, accompanies the decrease of coagulable nitrogen in the boiled samples of storage eggs, while there is apparently a tendency for the amido bodies to decrease."

An examination of stored eggs showed that some of the egg constituents have a tendency to become crystalline on storage, small rosette crystals being found in the yolk of eggs thus kept for a few months. The attempts which were made to isolate and prepare these crystals for identification have not as yet given definite results. "It is perhaps possible that they belong to the class of substituted fatty bodies, but no definite statement can be made except that it seems that they are not tyrosin. The observations of these bodies seems to be entirely new, as no account has been found of them in other publications. It is probable, therefore, that their existence may be regarded as one of the means of distinguishing eggs which have been a considerable time in cold storage from fresh eggs."

As regards the general effects of cold storage on poultry, "summing up the organoleptic properties, it may be said that for a short time, possibly 6 weeks or even longer, there is no perceptible change produced in a chicken by having it frozen. There certainly does not seem to be any evidence that it is better, and there is no convincing evidence that it is any worse. After 3 months, however, the fresh chicken is easily distinguished by its properties, as a rule, from the cold storage chicken, even after cooking, and to an absolute certainty before cooking. This distinction between the fresh and stored bird becomes more and more marked as the time of storage is increased. In so far as the drawn and undrawn chickens are concerned there is much less certainty of being able to distinguish between them. However, 70 per cent of the jurors were able to pick out the undrawn bird by its stronger odor and taste after a storage period of from 6 to 15 months, but at the test representing 18.5 months' storage the two birds were about equally dry and tasteless.

"The general conclusion is, therefore, that in the case of frozen birds there is no indication of any improvement in quality, that is, in taste, odor, or flavor, during cold storage. There is a deterioration which is noticeable, even at the end of 3 months, and becomes more marked as the time of storage grows longer. Hence, without any reference whatever to the question of wholesomeness, cold storage prolonged for 6 months or more appears to be distinctly detrimental as far as taste, flavor, and palatability are concerned. . . .

"The findings of the macroscopic investigations emphasize and confirm the organoleptic tests previously discussed in that there was observed a decided fecal and irritating odor, suggesting rancid fat, in the case of the undrawn fowls long in storage, existing coincident with the taste which enabled the jury to distinguish between the two methods of dressing. On the other hand, in the drawn fowls there was a tendency to a rancidity of the fatty portions of the abdominal region and a development of an odor somewhat similar to that produced by a butyric fermentation. In general, however, in so far as the bacterial investigations have proceeded, there is little choice between the drawn

and the undrawn fowl. It is possible that on longer keeping there will be developed, in from one to three years, important differences between the drawn and undrawn fowls which will enable them to be distinguished, both by their bacterial flora and by their organoleptic and chemical properties."

The studies reported show that histological changes take place which are proportional to the length of time poultry is held in storage. "The sinuous outline of the fresh fibers soon disappears in cold storage, and the fibers are not by any means so flexible as they were in the fresh state." Some of the poultry examined had been kept in storage as long as four years. "The most obvious change, however, which takes place during this interval [up to 4 years] is manifested as a structureless, granular substance which lies between the individual fibers and between their aggregations which are known as bundles. The origin of the substance is in the fiber itself, and in the earlier periods of storage its composition, according to reactions obtained with various selective dyestuffs which afford excellent microchemical reagents, is not very different from that of the normal fiber. As the storage period is lengthened, however, most marked differences between the normal and cold stored tissues, as exhibited in the staining reactions, make their appearance, and such changes, whether referable directly to bacterial or enzymic action, are essentially chemical, and deal with the fundamental principles composing flesh foods. . . .

"The intestines, which are left in situ in storage birds, show a very marked degeneration. Their muscular walls grow thinner in cold storage until they are the merest remnants, which threaten to disappear altogether and which even very careful handling may easily rupture. This degeneration is noticeably active in the muscular rather than in the cellular tissues of the intestines. This is important when it is considered that the bacterial flora of the intestinal contents will, of course, contain any pathogenic germs which usually accompany the colon bacillus. Hence the perforation of the walls of the intestines, which apparently takes place by continued digestive processes even in cold storage, would open the way for a rapid migration of such bacteria on thawing and previous to cooking. Thus it is quite possible that dangerous bacterial organisms might be translated to the edible portions of the fowl through the perforations of the intestines in the period between thawing and cooking. This degeneration of the walls of the intestines must, therefore, be regarded as highly significant."

Canned salmon, A. McGill (*Lab. Inland Rev. Dept. [Canada] Bul. 150, pp. 10*).—Of the 90 samples of canned salmon collected in the different Canadian inspectoral districts all were found to be in good condition and true to name.

Poisonous fish, V. G. Heiser (*Ann. Rpt. Bur. Health Philippine Islands, 1907, pp. 70, 71*).—A brief account is given of several sorts of fish found in the Philippine Islands, which are actively poisonous when eaten. A. Seale cooperated in the investigation.

On the occurrence of copper in oysters, J. T. Willard (*Jour. Amer. Chem. Soc., 30 (1908), No. 5, pp. 902–904*).—The uniformity with which copper was found in the oysters examined, according to the author, warrants the conclusion that it is a normal constituent. The methods followed in the analytical work are briefly described.

Young bees as a delicacy, M. Takaishi (*Bul. Col. Agr., Tokyo Imp. Univ., 7 (1908), No. 5, pp. 641, 642*).—The use of young bees and bee larvæ as a food in Japan is discussed and an analysis of such canned bees reported.

Report on dehydrated vegetables, milk, egg, etc., H. A. Dent (*Navy Dept., Bur. Supplies and Accts., Mem. Inform. Off. Pay Corps, [etc.], No. 85, pp. 626, 627*).—Dehydrated eggs and a majority of the dehydrated fruits and vegetables tested on vessels of the U. S. Navy gave satisfactory results. The results ob-

tained with milk powder "would indicate that it is not as good a substitute for fresh milk as the tinned article." In making up rations the author suggests that 1½ lbs. of the evaporated vegetable should be considered a substitute for the ordinary allowance of similar fresh vegetables.

Concerning preserved egg yolk, A. SCHOONJANS (*Bul. Soc. Chim. Belg., 22 (1908), pp. 119–122; abs. in Chem. Zentbl., 1908, I, No. 18, p. 1733*).—Boric acid was identified in preserved egg yolk.

Flour bleaching, H. SNYDER (*Minnesota Sta. Bul. 111, pp. 101–143, figs. 3*).—The results of investigations of various questions related to the bleaching of flour by oxids of nitrogen are reported, including among others experiments on the digestibility by healthy men of bread made from bleached and unbleached flour, the character of the fat and gluten of bleached and unbleached flour, and the distribution and occurrence of nitrites in food products.

Quotations from the author's summary follow:

"The bleaching of flour is a natural process and takes place when flour manufactured from well cleaned wheat is stored in thoroughly ventilated warehouses. With natural aging and bleaching there is a slight improvement in bread-making value.

"The coloring matter of flour is an unstable organic compound readily acted upon by heat, light, air, and a number of chemical reagents. It is mechanically associated with the fat and gluten as an impurity.

"None of the methods proposed for flour bleaching except the use of minute amounts of nitrogen peroxid as that generated by the discharge of electricity in the air, have survived the experimental stage. . . .

"The fat from bleached and unbleached flour milled from the same wheat is identical as far as iodin absorption number, nitrogen content, and heat of combustion are concerned, no greater differences being observed between the fat from the two flours than in the case of duplicate determinations on the same sample.

"The glutens from the bleached and unbleached flours are identical in physical properties and show the same index of refraction.

"The nitrogen peroxid used in small amounts in the electrical bleaching of flour exerts no chemical action upon the flour other than upon the coloring matter. The nitrogen peroxid appears to act in its well known capacity of carrier of atmospheric oxygen, taking up oxygen from the air, oxidizing the coloring matter, and again taking up oxygen from the air without itself entering into the chemical composition of the flour.

"The nitrite reacting material in flour appears to be in physical rather than chemical combination. When the flour is heated, the nitrite reacting material imparted by bleaching is expelled. All of the nitrite reacting material in the gas employed for bleaching can be accounted for as soluble and volatile nitrites in the flour and in the air surrounding the flour, leaving no nitrite reacting material to chemically combine with the fat or gluten. When the bleaching gas was brought in contact with pure sand, with which it can not unite chemically, the same amounts of nitrites were absorbed as in the case of flour.

"In tests where different quantities of gas were used it was found that the amount of nitrite reacting material left in the flour increased with the amount of gas used up to a certain point, and that when a large excess of the gas was employed there was permanently retained in the flour no more than when less of the gas was used.

"It was found that no relationship whatever existed between the nitrite reacting material in the flour and in the bread. Breads from both bleached and unbleached flours when baked in a gas oven where there was poor ventilation contained the same amount of nitrites. When the breads were properly made

and baked out of contact with the combustion gases no reaction was secured for nitrites. Bread can not contain any appreciable amount of nitrite reacting material, as the carbon dioxid and organic acids produced during bread-making liberate nitrites.

"In 15 digestion experiments with men no difference whatever was observed in the digestibility of breads from bleached and unbleached flour. The bleaching of the flour exerted no influence whatever upon the amount of nutrients absorbed and digested. Artificial digestion experiments with pepsin solution gave similar results.

"A kerosene lamp will produce in 1 hour 0.00027 gm. of nitrite nitrogen. This is over five times more than is present in a pound of an average sample of commercially bleached flour. Nitrites are produced as a result of combustion of all fuels and organic substances containing nitrogen. Flour exposed to wood smoke for a few minutes will contain more nitrites than when electrically bleached. Foods prepared by recognized and approved methods, as smoking of meats, contain nitrites. Salted, smoked and cured bacon, hams and similar meats, contain much larger amounts of nitrites than bleached flour. . . .

"In bread-making tests of commercially bleached flours no difference whatever was observed between the breads produced from the bleached and the unbleached flours milled from the same wheats, except that the bleached flours produced a whiter bread and also showed a tendency to produce larger sized loaves. Bleaching of the flour did not impart any odor or taste to the bread or leave in it any residue. . . .

"The bleaching of flour has a slight drying effect resulting in the consumer receiving a proportionally larger amount of dry matter in the flour."

Causes of the quality strength in wheaten flour, A. E. Humphries (*Rpt. Brit. Assoc. Adv. Sci., 1907, pp. 487, 488*).—The author states that although climate and soil influence quality they are not the determining factors in producing strength in flour. Manuring or early cutting at harvest time has no beneficial effect on quality, nor does the percentage of natural moisture in well-harvested wheat indicate it. "Quick growth or rapid maturation of wheats grown in England is not correlated with strength."

According to the home-grown wheat committee of the National Association of British and Irish Millers strength should not be measured by the quantity of water required to make doughs of standard consistency, or the quantity of bread per sack, or the way flour behaves in the dough, "but by its capacity for making big, shapely, and therefore well-aerated loaves. This definition covers two characteristics; one, a flour's capacity for making gas in yeast fermentation, more particularly its capacity for making gas at the latest stages of fermentation; the other, its capacity when made into dough for retaining the gas so generated."

Some considerations determining the strength of flours, J. L. Baker and H. F. S. Hulton (*Rpt. Brit. Assoc. Adv. Sci., 1907, pp. 488, 489*).—From their studies of the subject the authors do not believe that the diastatic activity of flour is likely to afford evidence as to baking quality, but in their opinion a study of enzyms other than diastase which may be present, seems a hopeful line for investigation.

New process of bread making [using cotton-seed meal] (*Oper. Miller, 13 (1908), No. 6, p. 280*).—A brief account of the use of cotton-seed meal with wheat flour for making bread and similar foods, according to a process devised by C. E. Wait.

Do macaroons contain hydrocyanic acid (prussic acid)? W. T. Koch (*Pure Products, 4 (1908), No. 5, pp. 205–207*).—According to the author's observations, macaroons containing some bitter almonds or other fruit kernels which generate

hydrocyanic acid when well baked are not dangerous from the standpoint of hydrocyanic poisoning unless fresh sweet almonds, which contain active emulsin, are eaten at the same time. If, however, the sweet almonds are eaten before the macaroons "it may be assumed that the splitting off of hydrocyanic acid in the stomach is very slight, as the pepsin of the stomach considerably weakens the effectiveness of the emulsin."

Tarragon essence and some of the derivatives of tarragon, M. Daufresne (*Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 5, pp. 330–335; Ann. Chim. et Phys., 8. ser., 13 (1908), Mar., pp. 395–432*).—An extended study of tarragon essence and its constituents.

Fecal contamination of fruit and vegetables, A. Ressel (*Über fäkale Verunreinigungen auf Obst und Gemüse. Inaug. Diss., Univ. Berlin, 1907, pp. 27; abs. in Hyg. Zentbl., 4 (1908), No. 1, p. 16*).—Investigations showed that Coli bacilli are very generally found on fruit and vegetables, which the author believes points to wide distribution in the atmosphere, etc., of fecal contamination.

Meat and food inspection, W. Robertson (*Chicago, 1908, pp. X+388, figs. 40*).—In this handbook for students and others the author has dealt with such questions as housing of dairy stock, control of milk traffic, distribution of milk, slaughterhouses, and meat inspection, and with local enactments bearing upon the feeding and housing of animals and related questions with special reference to conditions in Great Britain. The book also contains a supplement, Regulations governing Meat Inspection in the United States, by M. Herzog.

Notices of judgment (*U. S. Dept. Agr., Notices of Judgment 5–11, pp. 10; 12–17, pp. 13; 18–21, pp. 7; 22–24, pp. 7; 25, pp. 11; 26–27, pp. 4*).—These Notices of Judgment have to do with the misbranding of vanilla extract, cider, eggs, cocain hydrochlorid, flour, a drug and a drug product, canned blackberries, the adulteration of milk, and the adulteration and misbranding of whisky, honey, vinegar, and molasses.

Pure food legislation, V. G. Heiser (*Ann. Rpt. Bur. Health Philippine Islands, 1907, pp. 26–41*).—The text is given of the Pure Food and Drugs Act of the Philippine Islands, which became effective in May, 1907. This law is practically identical with the United States Food and Drugs Act except for some modifications necessitated by local conditions.

Federal food laws. II, Meat and meat products, cider, fruit, vegetables, and eggs (*Pubs. Soc. Suisse Paysans, No. 27, pp. 148*).—A collection of Swiss pure food laws and enactments.

Food chemistry in the years 1906 and 1907, G. Fendler (*Ztschr. Angew. Chem., 21 (1908), Nos. 16, pp. 721–732; 17, pp. 769–777*).—A digest and discussion of work which has been published on methods of analysis, preservatives, meat and meat products, eggs, milk, and other foods and food groups, and related topics.

The household baker, J. J. Doherty (*Los Angeles, 1908, pp. 190, pl. 1*).—Recipes are given for the preparation of breads, pastries, desserts, candies, etc. Many of the dishes are those which are usually served in hotels and restaurants, but it has been the author's intention to give quantities suitable to household use. The volume is compiled on the basis of personal experience.

Cost of living in New Jersey (*Ann. Rpt. Bur. Statis. Labor and Indus. N. J., 30 (1907), pp. 141–157*).—The data summarized have to do with retail prices of foodstuffs for different New Jersey cities and towns for the month of June, 1907.

Report to the International Congress of Alimentary Hygiene on questions submitted, N. Zuntz (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 5, pp. 749–762*).—The value of the respiratory quotient as a means of judging of the

function of a foodstuff, the definition of the term "foodstuff," the isodynamic replacement of nutrients in connection with the protein minimum and other questions are discussed.

Maintenance ration at different ages, E. Maurel (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 5, pp. 763–854*).—A summary of available data and of the author's experiments, from which dietary standards are deduced for varying conditions of age, sex, body weight, activity, and surrounding temperature. For normal maintenance the author believes that the protein consumption need only slightly exceed 1 gm. per day per kilogram body weight during the first months after birth, and 1.75 gm. during infancy, gradually diminishing to 1.5 gm. during middle age and to less than 1 gm. during old age. He does not believe that smaller amounts than these are safe. On the same basis, the suggested energy requirement is 65 to 70 calories per day per kilogram of body weight at birth, 35 to 38 calories in middle life, 30 to 35 calories in the first period of old age, and 25 calories, or perhaps lower, in extreme old age.

School diet, P. Legendre (*Abs. in Rev. Sci. [Paris], 5. ser., 9 (1908), No. 23, p. 723*).—A discussion of the character and effects of the diet in French schools with reference to adequacy and hygienic requirements.

The author believes that children should not have meat until 7 years old and that the normal meat ration from 7 to 11 years is 100 to 120 gm., from 11 to 16 years 120 to 160 gm., and thereafter 200 gm. or more per day.

The régime and diet of a man engaged in intellectual work, M. de Fleury (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 5, pp. 855–878*).—Chiefly a discussion of data relative to mental work and its relation to dietary requirements. Of 166 cases of sickness among brain workers of a sedentary life in which the symptoms were primarily those of nervous exhaustion, the author states that his diagnosis developed the fact that the great majority were due to errors in diet, as through overeating, abuse of meats, fatty foods, alcohol, coffee, tea, tobacco, and other stimulants. In his opinion the majority of brain workers over 40 years of age exercise too little and eat too much, and he proposes menus supplying about 82 gm. protein and 2,200 calories of energy per man per day, which he deems suitable for the average mental worker.

Chemical problems in hospital practice, O. Folin (*Jour. Amer. Med. Assoc., 50 (1908), No. 18, pp. 1391–1394*).—A summary and discussion of problems relating to nutrition, particularly phases of the creatin and creatinin question and other questions concerning metabolism.

The excretion of sulphurous acid by man in experiments with sodium sulphite, F. Franz and G. Sonntag (*Arb. K. Gsndhtsamt., 28 (1908), pp. 225–260; abs. in Chem. Zentbl., 1908, I, No. 15, pp. 1177, 1178*).—In a study of sulphurous acid, its sodium salts and their effects, it was found that the acid is very largely excreted in the urine as sulphate. However, with special precautions and within 10 minutes to a quarter of an hour after it was taken it was possible to detect SO_2 in the urine though the amount recovered was never greater than 1 per cent.

A respiration calorimeter, M. Letulle and Mlle. M. Pompilian (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 4, pp. 645–665, figs. 14*).—The respiration calorimeter referred to in a previous note (E. S. R., 18, p. 962) is described in detail.

ANIMAL PRODUCTION.

Analyses of commercial feeding stuffs, B. L. Hartwell, J. F. Morgan, and L. F. Whipple (*Rhode Island Sta. Bul. 127, pp. 162–179*).—Analyses are reported of animal meal and bone, cotton-seed meal, linseed meal, gluten feed, brewer's grains, malt sprouts, wheat middlings, wheat bran, mixed feeds, prov-

ender, hominy meal, horse feeds, dairy and stock feeds, poultry feeds, dried beet pulp, and miscellaneous commercial feeds. Notes are given concerning the value of some of the samples analyzed.

Mealie meal. J. McCRAE (*Transvaal Govt. Labs. Ann. Rpt. 1906–7, p. 14*).—The average composition of a large number of samples of husked mealie meal analyzed is as follows: Moisture 11.94, protein 9.08, ether extract 3.49, nitrogen-free extract 73.86, crude fiber 0.67, ash 0.96 per cent, and of ground mealie meal, water 14.24, protein 8.74, ether extract 4.12, nitrogen-free extract 70.09, crude fiber 1.75, ash 1.06 per cent.

[Analysis of] rust affected straw. E. F. LADD (*North Dakota Sta. Rpt. 1907, pt. I, p. 42*).—In 6 samples of oat and wheat straw that had been affected by rust and analyzed to ascertain whether such straw retains its feeding value to a larger extent than straw not affected, the nutritive value was found to be not greater than that of the average straw which has not been affected seriously by rust. This would seem to indicate that not only is there less nutritive value contained in the kernel but there is also a deficiency of food material in the straw itself.

The adulteration of feeding stuffs. LEMMERMANN (*Illus. Landw. Ztg., 28 (1908), No. 85, pp. 733, 734*).—The author calls attention to the extent to which feeds now on the German market are adulterated, and advocates the passage of laws to prevent it. It was found that 80 per cent of all brands were adulterated. A sample of wheat bran contained 26 per cent of sand and a sample of barley bran 35 per cent of sand. A list of adulterated feeds is given.

Some recent feeding experiments. B. L. HARTWELL (*Rhode Island Sta. Bul. 127, pp. 143–161*).—This is a popular summary of recent feeding experiments at 18 experiment stations, prepared for the use of Rhode Island farmers.

Dried beet pulp as a feed for animals. L. MALPEAUX (*Sucr. Indig. et Colon., 72 (1908), No. 13, pp. 383–391*).—Four million tons of pulp are produced annually at the beet sugar factories of France. This must be removed in a very short time or it will decompose. Some is put into silos where it ferments with a loss of nutrients, although the digestion coefficient of the pulp is greater than that of beet roots, and the process renders the cellulose more digestible.

Analyses of pulp silage at different ages are given. At 8 months the total dry matter fell from 8.6 per cent to 5.92 per cent, the digestible protein from 0.135 to 0.082, and the carbohydrates from 2.76 to 1 per cent. Fermented pulp silage is thought to give a peculiar flavor to milk and to cause gastro-enteritis in children fed with such milk. Drying the pulp avoids this trouble, saves the loss by fermentation, and renders the material transportable. Drying the pulp by placing it in contact with sheet iron heated by steam is too expensive. In drying by hot air 60 to 70 carloads of coal are required to produce 100 carloads of dried pulp from 1,800 carloads of roots. The dried pulp should be soaked in water before it is fed to stock.

Tests with dairy cattle showed no appreciable difference in the flow of milk when fresh pulp and dried pulp were compared. Tests with sheep showed a greater gain in live weight with dried pulp, and this also appeared to be more palatable. Analyses of rations compounded with fresh and dried pulp are given.

Dried pulp as a food for cattle. P. DE GROULART (*Sucr. Indig. et Colon., 72 (1908), No. 14, pp. 418–420*).—Further notes as to the apparatus used for drying beet pulp noted above.

Beef production on high-priced land. H. J. WATERS (*Missouri Sta. Circ. Inform. 24, pp. 45, figs. 12; Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 133–176*).—A summary of information, based largely on the station work, to show that by selecting good animals, providing suitable pasture in summer, and proper food

and care in winter baby beef can be produced at a profit on high-priced land. The silo is deemed as important on a beef as on a dairy farm. The summer season is the best time for the fattening period. "Obviously the man who raises cattle on high-priced land should feed them out as baby beef, and would have occasion to raise and feed in the same connection a large number of hogs, the legume area being especially adapted to the growing and finishing of hogs with a minimum loss from disease and with a maximum profit."

Experiments with diastasolin in the feeding of calves, E. HASELHOFF (*Fühling's Landw. Ztg., 57 (1908), No. 19, pp. 647–665*).—A ration of skim milk and diastasolin was much cheaper than whole milk, although at the commencement of the feeding period faster gains were made with the whole milk.

Mendelian characters among Shorthorn cattle, J. WILSON (*Sci. Proc. Roy. Dublin Soc., n. ser., 11 (1908), No. 28, pp. 317–324*).—The author has studied the data in volume 52 of the Shorthorn Herd Book to see if the Mendelian inheritance of coat color would throw any light on the origin of Shorthorn cattle. The results as expressed in Mendelian form are as follows: 95 reds crossed by reds produced 90 reds and 5 roans, 1 white crossed by white produced 1 white, 78 reds crossed by whites produced 78 roans, 370 roans crossed by roans produced 90 reds, 178 roans, and 102 whites, 426 roans crossed by reds produced 214 reds, 209 roans, and 3 whites, 53 roans crossed by whites produced 34 roans and 19 whites. These ratios show that the roan Shorthorn is a hybrid between two races, one white, the other red.

"It may be of some interest to show the colors of the calves when reds are crossed by roans—first, when the bull is red, and secondly, when the bull is roan. They are as follows: 150 red bulls produced from 150 roan cows, 86 reds, 63 roans, 1 white; 276 roan bulls produced from 276 red cows, 128 reds, 146 roans, and 2 whites."

Inheritance of coat color in the cattle of East Flanders, C. VAN DAMME (*Rev. Gen. Agron., n. ser., 3 (1908), No. 9, pp. 363–365*).—From a study of the herd book of the federation of breeders' associations of East Flanders for the years 1905–1907, the author finds that the red and white piebald is a very predominant color. When both parents were red and white the offspring were 96 per cent red and white, 2 per cent blue-gray, and 2 per cent black piebald. Blue-gray males crossed with blue-gray females gave 50 per cent blue-gray, 20 per cent black or black piebald, 20 per cent red piebald, and 10 per cent white. Blue-gray males crossed with black piebald females gave 40 per cent black or black piebald, 32 per cent blue-gray, 22 per cent red piebald, and 6 per cent white. Blue-gray males crossed with red piebald females gave 44 per cent red piebald, 20 per cent black or black piebald, 26 per cent blue, and 10 per cent white.

Cattle breeding in Zambi (*Bul. Off. État Indépend. Congo, 24 (1908), No. 6–9, Sup., pp. 195–200, pl. 1*).—The region about Zambi had 653 head of cattle January 1, 1908, a gain of 444 in the last 3 years. There are three types of cattle. The polled cattle are good grazers. Those with large well-formed horns are well adapted for dairying. The natural pastures are of good quality. On the bottom lands is a native grass, *Imperata cylindrica*, which is palatable when young and tender, but the best pastures are on the hillsides and high lands.

Ration experiments with lambs, 1906–7, G. E. MORTON (*Wyoming Sta. Bul. 79, pp. 3–14, figs. 3*).—Feeding tests since 1905–6 (E. S. R., 19, p. 266) are reported, each test lasting 14 weeks. When Shropshire-Merino lambs were divided into 2 lots of 40 each, the one receiving a ration of native hay, oats, and oil meal made an average gain per head of 20.3 lbs. at a cost of 6.63 cts. per pound, and the lot fed alfalfa hay and corn gained 34.3 lbs. per head at a cost of 4.26 cts. per pound. Of 2 lots of grade Cotswold lambs of 40 each, the

lot fed on peas in the field made an average gain per head of 18.3 lbs. at a cost of 7.6 cts. per pound, and the lot fed pea hay gained 5.8 lbs. at a cost of 8.67 cts. Shropshire-Merinos were also divided into 6 lots of 10 each, with the following results: The lot fed alfalfa hay and corn made a gain per head of 34.4 lbs. at a cost of 4.01 cts. per pound; the lot fed sweet clover hay, corn, and oil meal made a gain of 30.7 lbs. at a cost of 4.93 cts. per pound; the lot fed pea hay gained 16.9 lbs. at a cost of 3.68 cts. per pound; the lot fed native hay, Scotch barley, and oil meal gained 22.8 lbs. at a cost of 5.83 cts. per pound; the lot fed native hay, bald barley, and oil meal made a gain of 22.5 lbs. at a cost per pound of 5.83 cts.; and the lot fed native hay, spelt, and oil meal gained 13.8 lbs. at a cost of 9.07 cts. per pound.

"Scotch barley equals corn when fed with alfalfa hay. Alfalfa and ground flaxseed make a very satisfactory ration." Analyses of the feeds are given.

Rational sheep feeding, F. B. Mumford (*Missouri Sta. Circ. Inform. 25, pp. 15, figs. 3*).—A résumé of experiments at the station and elsewhere in feeding young lambs and in fattening growing lambs, together with a discussion of the feeding of breeding ewes.

"Lots receiving corn in the fattening ration, either in whole or in part, produced the best gains, were apparently in better finish, and in general were fed at a greater profit than the lots fed any other ration.

"A grain ration made up exclusively of wheat bran proved to be inferior for fattening lambs.

"The animals fattened on rape during the fall and in good condition at the beginning of the experiment were essentially as successful feeders as those in poorer condition that were pastured on grass during the same fall period."

Roots were a valuable addition to the grain ration. The use of a self-feeder was regarded as expensive. In the tests reported warm barns for fattening lambs were not found desirable. Shearing lambs in March produced an increased rate of gain, while shearing late in the fall is not deemed advisable.

The general management of sheep, A. Mansell (*Natal Agr. Jour., 11 (1908), No. 8, pp. 951–965*).—A popular article on sheep breeding and management.

Goat raising, with a description of German and Swiss breeds, G. Wilsdorf (*Die Ziegenzucht mit Ausführlicher Beschreibung der Deutschen und Schweizer Ziegenrassen und Schläge. Berlin, 1908, pp. VIII+228, figs. 52*).—A general treatise on goat breeding in Germany. A short historical sketch is followed by full descriptions of the principal breeds and their care and management in health and disease.

Feeds supplementary to corn for southern pork production, D. T. Gray, J. F. Duggar, and J. W. Ridgeway (*Alabama Col. Sta. Bul. 143, pp. 27–77*).—A summary of 3 years' work in feeding corn supplements to 90 hogs of somewhat better quality than the average hogs of the State. At the beginning of the test they averaged about 5 months of age and weighed about 70 lbs. each.

Money was always lost when corn was fed alone, as when so fed it realized on an average only 48 cts. per bushel. "When corn was supplemented with a partial ration of cotton-seed meal the daily gains and the financial outcome were satisfactory. Four deaths occurred as a result of the use of cotton-seed meal, but these deaths did not occur while the animals were eating the meal. All of the deaths have occurred soon after the animals were taken off of cotton-seed meal and placed upon a ration which contained no cotton-seed meal. This suggests the idea that cotton-seed meal may be stimulating in its effects—similar to the action of certain drugs—and when it is removed suddenly from the animals that death may occur through depression."

Peanuts made the most satisfactory pasture, soy beans ranking second. Tankage proved exceedingly satisfactory.

"Mature sorghum pasture has very little to recommend it as a feed for fattening swine. Both the gains and the financial outcome were unsatisfactory.

"When the sorghum was cut and carried to the hogs the results were better than when the hogs were made to graze the crop.

"The expense of extracting the juice from the sorghum and feeding the juice only prohibits its use in this way, although excellent daily gains were made. In no case was the juice found to be worth more than 1.8 cts. a gallon as a feed for hogs."

The results with various corn supplements for the past 3 years were as follows: When corn was fed alone the average daily gain was 0.69 lb. at a cost of 7.63 cts. per pound; with corn and cotton-seed meal 2:1 the daily gains averaged 1.04 lbs. at a cost of 5.75 cts.; with corn and tankage 9:1, 1.04 lbs. at a cost of 5.18 cts.; with corn and cowpeas 1:1, 0.94 lb. at a cost of 5.11 cts.; with corn and peanut pasture 1.01 lbs. at a cost of 3.2 cts. and with corn and sorghum pasture 0.37 lb. at a cost of 11.9 cts. With corn and cotton-seed meal 2:1 and peanut pasture the daily gains averaged 1 lb. at a cost of 2.14 cts.; with corn and cotton-seed meal 2:1 and sorghum pasture 0.46 lb. at a cost of 7.79 cts.; with corn and chufa pasture 0.72 lb. at a cost of 8.89 cts.; with corn and soy bean pasture 1.02 lbs. at a cost of 2.74 cts.; and with corn and cotton-seed meal 2:1 plus cut sorghum 0.75 lb. at a cost of 4.86 cts.

The cost of planting and cultivating the pasture is included in these figures. Corn was valued at 70 cts. and cowpeas at 80 cts. per bushel, and cotton-seed meal at $20 and tankage $40 per ton. "When hogs sell from 5 to 7 cts. a pound live weight the farmer can not afford to sell his corn for 70 cts. per bushel." Tables show the prices realized on each bushel of corn when hogs sold at various prices.

"While the results are not all in agreement, yet they seem to indicate that it is more often profitable to finish hogs upon dry feeds rather than to sell directly from pastures."

Slaughter tests were made, from which it is concluded that when hogs dress 72 per cent of the live weight it makes little difference whether they are sold at 5 cts. per pound live weight or 7 cts. per pound dressed weight if the expense of killing is not considered. At these prices, however, a hog that will dress 80 per cent is more profitably sold when dressed.

Swine feeding, C. A. Willson (*Missouri Sta. Circ. Inform. 28, pp. 16, figs. 3; Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 216–231*).—A popular discussion of the care and management of swine, and of the investigations at several experiment stations on the subject.

The first farmers' bacon factory in the United Kingdom, L. M. Douglas (*Natal Agr. Jour., 11 (1908), No. 8, pp. 966–972, pl. 1*).—A study of the farmers' cooperative bacon factories which have stimulated the curing of bacon in Denmark, led to the formation of a cooperative factory at Roscrea, Tipperary County, Ireland, long noted as a pig-raising district. The factory has been in operation since January 2, 1908. There are about 28,000 shareholders. Two hundred pigs per week are handled, but the Wiltshire sides, sausages, and black puddings produced are not sufficient to supply the home demand.

Feeding and care of horses, E. A. Trowbridge (*Missouri Sta. Circ. Inform. 27, pp. 10, figs. 3; Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 206–231*).—Contains general information regarding the feeding and care of stallions, breeding mares and foals, growing horses and work horses.

Dried potatoes as a food for horses, E. Parow (*Ztschr. Spiritusindus., 31 (1908), No. 42, pp. 462, 463*).—Additional notes (E. S. R., 19, p. 570), wherein

the author states that dried potatoes are much cheaper than oats and pound for pound are as valuable as a feed for horses.

The relation between form and function, with special reference to the horse, S. von Nathusius (*Fühling's Landw. Ztg., 57 (1908), No. 12, pp. 417–429, figs. 4*).—The author believes that a correlation exists between form and function, pointing out that a comparison of the forms of the greyhound and the thoroughbred horse, both of which have been bred to run at a high rate of speed for short distances only, shows a close resemblance, whereas the foxhound and the hunter, which must maintain a good speed for long distances have a form quite different. A large number of measurements on horses of different breeds are presented in support of the views of the author, who maintains that animals must be bred for a single purpose and that to obtain a certain function the breeder must consider the form in choosing the breeding stock.

The influence of eggshell on metabolism during incubation, F. Tangl and G. Hammerschlag (*Arch. Physiol. [Pflüger], 121 (1908), No. 8–10, pp. 423–436*).—Experiments with hens' eggs showed that both the shell and membrane lining it play a part in the development of the chick. During incubation organic and inorganic material disappear from the shell, the former in larger proportion. Of the total material thus removed more than half is organic material when expressed on a water-free basis. The greater part of the inorganic material thus removed consists of calcium.

According to the authors' figures, the shell of an egg weighing 60 gm. loses during incubation 0.4 gm. dry matter, of which 0.15 gm. is calcium and 0.2 gm. organic material.

The experimental data furnish an explanation of the well-known fact that eggshells become more fragile during incubation.

Breeds of poultry described and illustrated, O. Trieloff (*Das Grossgeflügel in Wort und Bild. Magdeburg, [1908], pp. 80, figs. 37*).—This work treats of the peacock, turkey, pheasant, goose, duck, bantam, guinea, and common fowl. Many and little known breeds are included.

Preservation of eggs, F. Prall (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 7, pp. 445–481; abs. in Zentbl. Agr. Chem., 37 (1908), No. 7, pp. 486–489; Hyg. Viande et Lait, 2 (1908), No. 8, pp. 362–367.*)—Eggs kept in closed glass vessels embedded in sand spoiled in 6 weeks, thereby indicating the necessity of ventilation. Kept in cool cellars with good ventilation they remained fresh as long as when packed in sand, straw, or other material. Eggs coated with paraffin or with hydrofluosilicic acid soon spoiled. Better results were obtained by coating with shellac. Preservation by coating with permanganate of potash or a solution of water glass or Hanika's method of dipping in hot water and alcohol gave good results. A 10 per cent solution of water glass is considered the best liquid preservative, although glycerin, limewater, and a 3 per cent solution of water glass are good. In practice, dry preservation in cold storage near the freezing point with an atmosphere of 80 per cent humidity is especially recommended.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Cropping systems for New England dairy farms, L. G. Dodge (*U. S. Dept. Agr., Farmers' Bul. 337, pp. 24, figs. 2*).—Typical farms, representing the best methods in the different sections of New England, are described to show what may be accomplished to increase the amount of milk and butter that can be produced per acre. A short rotation, which will include clover and corn silage, is recommended.

"In the most northern sections such as northern Maine, where corn is out of the question and potatoes fill the place of corn in a rotation, silage can still be made from Japanese millet or other crops and succulent winter feed thus provided. Clover and Italian rye grass are successfully used for silage in the State of Washington. This combination is worthy of trial in northern Maine."

On the feeding value of alfalfa, J. J. HANSEN (*Landmandsblade, 41 (1908), No. 21, pp. 275–278*).—A feeding trial with 40 cows lasting 140 days is reported, in which the comparative feeding value of sunflower-seed cake and green alfalfa was studied. The results suggest that 6 to 7 lbs. of green alfalfa have a nutritive value similar to that of ¾ lb. of sunflower-seed cake when fed to cows, whether these are pastured a portion of the day or fed wholly in the stable.

Comparison of cotton-seed meal and hulls with cold pressed cake as a dairy feed, J. G. LEE, Jr., and T. E. WOODWARD (*Louisiana Stas. Bul. 110, pp. 3–22*).—Experiments were undertaken in cooperation with the Bureau of Animal Industry of this Department to determine the true value of cold pressed cotton-seed cake, a comparison being made with a mixture of cotton-seed meal and hulls 2:1. Twelve cows were divided into 2 lots and fed for 2 periods of 28 days each. In the first period lot 1 received a maintenance ration of alfalfa hay and hulls 2:1 at the rate of 2 lbs. of the mixture for each 100 lbs. live weight, and in addition, a ration for milk production consisting of cotton-seed meal, cotton-seed hulls and corn meal 2:1:3 at the rate of 1 lb. of the mixture for every pound of milk produced. The 6 cows produced 3,535 lbs. of milk, at an average cost of 1.048 cts. per pound. Lot 2 received the same ration as lot 1, except that cold pressed cake was substituted pound for pound for the cotton-seed meal and hulls of the milk ration. The 6 cows in this lot gave 3,774.8 lbs. milk at a cost of 1.033 cts. per pound. During the second period the rations of the 2 lots were reversed, when lot 1, receiving the cold pressed cake, made 3,358.5 lbs. at a cost of 1.77 cts. per pound, and lot 2, on the hulls and cotton-seed meal, produced 4,043.3 lbs. of milk at a cost of 1.892 cts. per pound.

"Cold pressed cotton-seed cake is not as valuable for milk and butter production as an equal weight of choice cotton-seed meal and hulls mixed in the proportion of 2 parts of meal to 1 part of hulls. The analysis of cold pressed cake is a reliable indication of its feeding value." A table shows the estimated value of cold pressed cake as compared with cotton-seed meal and hulls at different prices. Analyses are reported of the feeds used in the tests.

Silos and silage in Maryland, H. L. CRISP and H. J. PATTERSON (*Maryland Sta. Bul. 129, pp. 78, figs. 74*).—This bulletin treats of the construction of wood and concrete silos, with illustrations and descriptions of about 70 silos now in use in Maryland. The various silage crops and their uses for different animals are discussed. A table showing the chemical composition of various silage crops is given, this including analyses made at the station of refuse from corn and pea canneries.

Feeding the dairy cow, C. H. ECKLES (*Missouri Sta. Circ. Inform. 26, pp. 17, figs. 5; Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 190–206*).—Popular suggestions for the use of dairy farmers, with special reference to Missouri conditions.

Investigations on the effect of food fat upon the milk production of cows (*Bericht des Deutschen Landwirtschaftsrats an das Reichsamt des Innern betreffend Untersuchungen über die Wirkung des Nahrungsfettes auf die Milchproduktion der Kühe. B. Spezialberichte der Versuchsansteller. Berlin, 1907, pp. 411*).—A summary of this work has been previously noted (E. S. R., 19, p. 75).

The existence of a lactase in cow's milk, A. J. J. VANDEVELDE (*Acad. Roy. Belg., Bul. Cl. Sci., 1908, No. 5, pp. 563–577; Biochem. Ztschr., 11 (1908), No.*

1–3, pp. 61–66; abs. in Chem. Centbl., 1908, II, No. 9, pp. 815, 816).—The author continued the researches previously noted (E. S. R., 19, p. 777), with special reference to the question "Does cow's milk contain enzyms that are able to break down lactose in the absence of a lactic-acid bacteria?" Samples of milk were treated with iodoform, formaldehyde, and heat to render them germ free and kept at a temperature of 37.5° C. From a study of the chemical changes that took place the author concludes that lactase must be present in milk.

On the presence of hemolytic factors in milk, JANET E. LANE-CLAYPON (*Jour. Path. and Bact., 13 (1908), No. 1, pp. 34–37*).—"Milk when fresh contains both complement and amboceptor in about one-tenth strength that of serum.

"In order to obtain hemolysis, 'ox colloid' must be added, thus confirming Bordet's observations.

"On adding blood cells, which are capable of being hemolyzed by fresh ox serum to milk, the cream picks up the corpuscles and carries them to the top, forming a bright red plug. This plug is absent with milk heated for a few minutes to 70° C., and may be used as a test for heated or pasteurized milk."

A review of the literature on the transmission of immunity by milk is included.

Effect of heating upon the determination of leucocytes in milk, H. L. RUSSELL and C. HOFFMANN (*Amer. Jour. Pub. Hyg., 18 (1908), No. 3, pp. 285–291*).—The authors made a series of studies to compare the leucocyte content in raw and in heated milks.

Out of 60 examinations 50 showed an increased number of cellular elements in the sample heated to 70° over the unheated. When 31 samples were heated at different temperatures between 50 and 80° C., the most marked variation in cell content occurred between the temperatures of 60 and 70°.

Tests were made to ascertain if leucocytes were enmeshed by fat globules as they rise to the surface. As heating diminishes the creaming power of milk, a comparison was made of the supernatant liquid of unheated milk and that of heated milk after each had stood for 24, 48, and 72 hours. The average percentage of the original number found in the supernatant liquid of unheated milk was 74.5, and in milk heated to 70°, 3.54, which "leaves no doubt but that many of the cell elements in milk are not recovered in the sediment produced by centrifugalization under customary conditions. . . . A momentary exposure at 70° or above, or a more prolonged heating for a few minutes at 60° will so alter the physical arrangement of the fat globules in milk that practically all of the cellular elements may be recovered."

A preliminary note on a group of lactic-acid bacteria not previously described in America, E. G. HASTINGS (*Science, n. ser., 28 (1908), No. 723, p. 656*).—The author has found a lactic-acid bacterium which apparently belongs to the same class as those found in yoghourt and in Swiss cheese.

Bacteria in yoghourt, M. KLOTZ (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 13–14, pp. 392–398, figs. 3*).—A review of the literature on yoghourt. See also a previous note (E. S. R., 19, p. 1076).

Yoghourt, W. HENNEBERG (*Milch. Ztg., 37 (1908), No. 43, pp. 506–508; Ztschr. Spiritusindus., 31 (1908), No. 39, pp. 425, 426*).—A popular article on the nature and the methods of preparing yoghourt.

The improvement of the milk supply, I. C. WELD (*Mo. Bul. Ind. Bd. Health, 10 (1908), No. 9, pp. 100–102*).—A lecture before a conference of the State board of health with dairymen, giving results of an examination of dairy conditions in the State. "Out of the 91 places inspected, the highest scoring dairy was entitled to 84.4 points out of a possible 100. The lowest scoring dairy was

entitled to only 12.8 points. The average score of the entire 91 places inspected was 36.25 points."

Necessity for a standard of cleanliness in all milking competitions at agricultural shows, J. Howard-Jones (*Jour. Roy. Sanit. Inst., 29 (1908), No. 10, pp. 576–580*).—The observations of the author, who attended a milking competition at a leading agricultural show, would seem to indicate a general lack of cleanliness among the milkers. The cows were not groomed and but one milker rejected the first flow of milk. The author suggests that more attention should be paid to the hygiene of the milker.

The history of milk hygiene to the middle of the nineteenth century, W. Hanauer (*Hyg. Rundschau, 18 (1908), No. 20, pp. 1201–1214*).—A brief review of German work on this subject.

Dairy products in Switzerland in 1907, Leopold (*Mitt. Fach Ber. Erstat. K. K. Ackerb. Min. [Vienna], 1908, No. 9, pp. 6, 7*).—Contains statistics of the amount and value of exports and imports of dairy products in 1906 and 1907.

Report of the Bernese dairy school, A. Peter (*Jahresber. Molk. Schule Rütti-Zollikofen, 21 (1907–8), pp. 56, figs. 3*).—This report includes analyses of milk, cream, and butter, and a summary of the work done at this institution.

[Analyses of milk, condensed milk, and butter], J. McCrae (*Transvaal Govt. Labs. Ann. Rpt. 1906–7, pp. 9–13*).—The proportion of adulterated samples of all milk examined was 15.87 per cent. Added preservatives were found in 6 cases. The proportion of fat in full cream condensed milk increased the past year.

Contributions from the dairy institute of Greifswald. I, The advantages of formalin as a preservative in the manufacture of butter and cheese, R. Eichloff (*Milchw. Zentbl., 4 (1908), No. 3, pp. 115–119; abs. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 17–19, pp. 584, 585*).—The addition of 1 part of formalin to 10,000 parts of milk slightly hinders the separation of cream. Formalin doubled the length of time required for souring when added to raw or pasteurized cream or to cream inoculated with a pure culture of lactic-acid bacteria. It is suggested that in practical butter and cheese making it may be an advantage to add formalin when slow ripening of cream or curd is desired.

Studies on the rational manufacture of Grana cheese, C. Gorini (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 10–12, pp. 309–317; Milchw. Zentbl., 4 (1908), No. 6, pp. 241–250*).—A second report (E. S. R., 19, p. 574) on the causes of the defects in Grana cheese. It is considered that the cheese would be of better quality and of a more uniform character if more attention was given to the hygiene of the milk from which it is made and if pure cultures were used. As now manufactured the variety of organisms present tend to make the cheese variable in texture, color, and flavor.

Some essentials in cheese making, C. A. Publow (*New York Cornell Sta. Circ. 3, pp. 17–24, fig. 1*).—An outline of the best method of Cheddar cheese making is presented with a discussion of important factors. "The most important step in cheese making is to have the curd firm in the whey before the required amount of acid has developed." Directions for using the acidimeter are given in detail.

Defects in American Cheddar cheese, C. A. Publow (*New York Cornell Sta. Bul. 257, pp. 3–16*).—A ready reference list of the causes of defects in flavor, texture, color, and finish of American Cheddar cheeses and their remedies.

Investigations of a severe disease of Gorgonzola cheese, C. Gorini (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), 1, No. 8, pp. 568, 569; abs. in Chem. Zentbl., 1908, II, No. 1, p. 89*).—Preliminary notes of a disease that yellows and softens the texture and produces an abnormal odor in

Gorgonzola cheese. The author thinks it appears simultaneously with *Oïdium lactis*, and allied species of bacteria.

Trials of new dairy appliances, B. MARTINY (*Arb. Deut. Landw. Gesell., 1908, No. 144, pp. 68, pl. 1, figs. 30*).—Results of a trial of new kinds of separators recently placed on the market are given, and a contrivance for disinfecting a cow's udder is figured and described. This consists of a waterproof canvas which can be strapped to the animal so that the disinfecting liquid will come in contact with the udder for several minutes.

The Dalén and Celsing milking machine (*Nord. Mejeri Tidn., 23 (1908), No. 21, pp. 246, 247*).—A brief description of a new Swedish milking machine.

A practical milk cooler, H. J. GERSTENBERGER (*Jour. Amer. Med. Assoc., 51 (1908), No. 16, pp. 1328, 1329, fig. 1*).—A description of a galvanized cooling can made to accomodate a 5 gal. milk can.

Unfermented apple juice, H. C. GORE (*U. S. Dept. Agr., Bur. Chem. Bul. 118, pp. 23, figs. 4*).—This bulletin gives results of experiments since 1906 (E. S. R., 19, p. 276), on the preservation of unfermented apple juice. The usual objections to sterilizing, that a cooked taste is added to the juice and that it remains sterile for a limited period only, have been met. By using a pasteurizer costing $12 apple juice was heated from 65 to 70° C. and kept in paraffined kegs for 6 months without loss from fermentation. It can also be successfully sterilized in tin containers, but heating to a temperature of 65° C. for a half hour was not quite sufficient to sterilize all the varieties tested. The best treatment for sterilizing in glass was found to consist in heating for 1 hour at 65° or one-half hour at 70° C. The latter temperature did not produce a marked loss in flavor.

In clarification tests, large quantities of sediment were removed by passing juice from apples ground the previous evening through a cream separator, but clarification was not so complete as with perfectly fresh juice the previous year. Before canning or bottling apple juice it may be carbonated, although a foreign flavor is added. When benzoate of soda was added to unfermented apple juice in quantities varying from 0.03 to 0.15 per cent alcoholic fermentation was checked, but acetic acid and other fermentations developed with a consequent depreciation in flavor.

Improved methods of wine making, F. T. BIOLETTI (*California Sta. Bul. 197, pp. 159–168, fig. 1*).—The main work in enology has been to demonstrate and popularize certain principles and methods of wine making which have been shown to be useful by the experiments at this station. The new method of wine making (E. S. R., 17, p. 1187) has given good results, but improved varieties of grapes must be grown for the best results in the interior valleys.

The best yeast tested at the station was one originating in Champagne and is strong enough to ferment wines perfectly dry with over 15 per cent of alcohol. "It can withstand as high temperatures and as large an amount of sulphurous acid as any of our native yeasts which have been tested. One of its principal advantages is its tendency to form a concrete sediment, which remains at the bottom of the fermenting must or wine, and very much facilitates the racking and clearing. It has also been found equally suitable for champagne and cider-making. . . . The utility of pure yeast in our California wineries may be considered as demonstrated, but too much must not be expected of it. It will not prevent the ill effects of careless or ignorant practice, and no wine maker who can not make good wine without pure yeast will succeed with it."

Considerable attention has been given to the testing of the color capabilities of various varieties in different sections and to the devising of methods of utilizing economically the color which exists in the grapes now grown. The color of

all varieties is less in quantity and less stable in character in the warmer climates and richer soils. "For the San Joaquin Valley the best grapes for color, of those commonly grown in the State, are St. Macaire, Gros Mansenc, and Barbera, in the order named. Wines made from these varieties at Tulare and Fresno have from half again as much to three times as much color as the Bouschets, and the tint is better and more stable."

Experiments showed that at the end of 10 months wines made by heat extraction had lost 48 per cent of their color and those by the ordinary method 55 per cent. The color remaining in the pressed pomace can be extracted and utilized by refermenting with white or lightly colored grapes.

The varieties of grapes which have given good results in the coast region failed to produce good dry wines in the hot interior, though many of these varieties could be used successfully if they could be blended in the fermenting vat, or soon after, with 25 to 50 per cent of other varieties. Valdepeñas has proved the most satisfactory variety as a dry wine grape for the interior valleys, though unsatisfactory in cool regions. Dry white wines of fair quality can be made in the hot interior districts more easily than red, but have some of the same defects, namely, lack of acidity, flavor and freshness. Burger has been found to be a variety peculiarly suited to these regions, yielding a neutral, clean tasting wine, which only requires blending with a full flavored wine from the coast regions to be worthy of aging and bottling. The white varieties which have developed the highest acidity have been West White Prolific and Vernaccia Sarda. Johannisberger and Franken Riesling have given unexpectedly good results in the San Joaquin Valley.

The rôle of malic-acid fermentation in the manufacture of wine, A. Rosenstiehl (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 2, pp. 150–153; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 16, pp. 870, 871*).—The proportion of malic acid is important, as carbonic acid is necessary to protect the wine from premature decay and is produced from malic acid by the action of *Micrococci malolacticus*.

Artificial refrigeration in enology, R. Pini (*Rev. Vit., 30 (1908), No. 775, pp. 449–456; Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 4, pp. 256–266*).—This is a paper read before the First International Congress on Refrigeration, held at Paris, 1908, in which the author relates the advantages of artificial refrigeration, and the various processes of making and storing wines.

VETERINARY MEDICINE.

Animal industry and animal diseases in German Southwest Africa, W. Rickmann (*Tierzucht und Tierkrankheiten in Deutch-Südwestafrika. Berlin, 1908, pp. XII+364*).—The natural conditions in German Southwest Africa are favorable for grazing on a large scale in some localities and for raising fine stock on a small scale in other localities. The author suggests means for the improvement of horses, cattle, sheep, goats, hogs, and poultry and for the more economic management of animal industry.

The larger part of the volume is occupied with a detailed discussion of the diseases which affect animals in German Southwest Africa. Particular attention is given to malaria of horses, glanders, strangles, tetanus, rinderpest, Texas fever, pleuro-pneumonia, anthrax, blackleg, mange, fowl cholera, East coast fever, tuberculosis, rabies, swine plague, and a large number of accidental and organic diseases. Directions are given for carrying out simple and complex surgical operations and for the care of instruments and the administration of remedies.

Meat inspection and diseases of animals, J. B. Cleland (*Jour. Dept. Agr. West. Aust., 16 (1908), No. 2, pp. 119–126, pl. 1*).—Detailed statistical notes are

given on the number of cattle, sheep, calves, pigs, and goats slaughtered for food during the year 1906–7, together with a statement of the number of animals and parts condemned and the causes of condemnation.

Public abattoirs a necessity to eradicate consumption, etc., W. Holder (*Jour. Roy. Inst. Pub. Health, 16 (1908), No. 3, pp. 166–171*).—Attention is called to the frequency with which meat inspectors detect cases of anthrax, cysticerci, trichina, tuberculosis, and other diseases of animal parasites which may be transmitted to man. Meat inspectors are, therefore, considered as performing an important function in the protection of human health. It is recommended that laws should be passed requiring the erection and use of public abattoirs in every town and village.

The cat: A neglected factor in sanitary science, Caroline A. Osborne (*Pedag. Seminary, 14 (1907), No. 4, pp. 439–459*).—On account of the intimate association of the cat with other species of domestic animals and with man, and particularly children, it has seemed advisable to study the possibly important agency of the cat in the intertransmission of infectious diseases.

According to the results obtained by various investigators cats are susceptible to the majority of infectious diseases which attack man and animals. Even if the cat does not become infected with the disease it is still possible for this animal to transmit the disease upon its fur. Notes are given on the evidence thus far obtained connecting cats with the transmission of mange, diphtheria, scarlet fever, tuberculosis, smallpox, anthrax, malignant edema, ringworm, and a great variety of external and internal animal parasites. The author concludes that cats should be kept away from all sources of infection in order to prevent the unnecessary spread of infectious diseases.

The relation of the soil to certain diseases, Ludewig (*Ztschr. Veterinärk., 20 (1908), No. 3, pp. 108–112*).—According to the universal experience of veterinarians the soil is concerned in the transmission of such diseases as anthrax, blackleg, hemorrhagic septicemia, and swine erysipelas. Attention is called to the importance of preventing the excessive contamination of soil with the virus of these diseases, for after the soil has once become contaminated it is a difficult matter to disinfect it.

A theory of natural immunity of living tissue, F. Holzinger (*München. Med. Wchnschr., 55 (1908), No. 12, pp. 691, 692*).—In the opinion of the author living tissue at times is immune for the reason that the osmotic process in it hinders the development of micro-organisms. A considerable diminution in this activity is necessary before the micro-organisms can develop and produce a general infection.

Hemolysis and antihemoglobin, O. Demees (*Cellule, 24 (1907), No. 2, pp. 421–456*).—The experiments reported by the author were carried out on rabbits. It appears possible to obtain sera which contain antihemoglobin but are not hemolytic. Antihemoglobin and hemolysin are therefore distinct. Uninjured red blood corpuscles do not fix antihemoglobin and this substance has no effect upon the hemoglobin contained in the intact corpuscle.

Experiments with Bacterium anthracis, anthrax vaccines, and hyperimmunization, H. J. Milks (*Louisiana Stas. Bul. 109, pp. 3–21*).—As the result of experiments made in growing the anthrax bacillus upon different media liable to be found in pastures it is concluded that the organism will grow in low swampy places and even in any place where sufficient moisture is present. It is thought this may possibly explain its prevalence in certain years. Several experiments with guinea pigs, mice, rabbits, and sheep, made to determine the virulence of different commercial anthrax vaccines, resulted in the finding of a large variation.

In the immunity experiments 2 sheep that had survived the infection of one-half loop of agar culture were inoculated repeatedly at intervals of about 2 weeks with increased doses. "The inoculated material was from 24-hour agar cultures washed off and suspended in sterile water. The inoculations were made on the inside of the thigh in each case. No more serious symptoms developed than a slight swelling at the point of inoculation and a slight elevation of temperature."

An appended summary of data regarding the disease has been previously noted (E. S. R., 12, p. 787).

The application of atoxyl in veterinary medicine, Walther (*Berlin. Tierärztl. Wchnschr., 1908, No. 15, pp. 265, 266*).—Clinical notes, together with a statement of the results obtained, are given for a number of cases in which atoxyl was used in the treatment of hemoglobinuria and pneumonia in horses. Atoxyl appeared to have very little beneficial effect in the control of hemoglobinuria but a considerable percentage of cases of pneumonia were beneficially affected. In 2 cases, however, no effect of the atoxyl was to be observed.

Treating rabies with atoxyl, B. Heymann (*Ztschr. Hyg. u. Infektionskrank., 59 (1908), pp. 362–366*).—On account of the favorable results reported by a number of investigators from the use of atoxyl and other arsenical compounds in treating diseases caused by trypanosomes the author tested atoxyl in the treatment of rabies. The experimental animals were rabbits which received intramuscular inoculations of fixed virus. The animals were then treated subcutaneously or intravenously with daily doses of atoxyl ranging from 0.01 to 0.1 gm. No beneficial results were observed. In fact some of the animals succumbed sooner than would have been the case without the use of atoxyl. In view of the results obtained the author believes that neither trypanosomes nor spirilla can be considered as playing an etiological rôle in rabies.

Infection and immunization of mice against rabies through the alimentary tract, R. Repetto (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 15, pp. 716–718*).—Previous investigators have indicated the possibility of infecting and immunizing mice through the ingestion of rabies virus. The author soon found in his investigations that the ingestion of rabies virus exercised a more or less pronounced effect in immunizing mice against a subcutaneous inoculation with street virus. All the rats with which the author experimented died of rabies as result of feeding on rabies virus and 75 per cent of the mice were also fatally infected by feeding upon virus for 1 month. After mice and rats had been immunized by ingestion of an attenuated virus they proved to be resistant to subcutaneous inoculation. In further experiments with 10 mice it was found that feeding for some time upon normal nerve substance brought about a quite pronounced degree of immunity to rabies.

The hereditary transmission of immunity to rabies, P. Remlinger (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 7, pp. 321–323*).—In order to gain fresh evidence on the possibility of the transmission of immunity to rabies in animals the author experimented with rabbits. Experimental female rabbits were immunized shortly before the period of gestation and in some cases naturally immune males were used in breeding experiments. Results obtained by the author indicate that immunity is never transmitted by the male, while the female may transmit immunity in a considerable percentage of cases. Nevertheless under identical conditions such transmitted immunity may be fleeting and of low power. The blood of young animals which have acquired immunity by hereditary process appears not to have any immunizing value.

Biological and pathogenic properties of Sterigmatocystis lutea, Sartory and Jourde (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 10, pp. 548, 549*).—When rabbits are inoculated in the peripheral vein of the ear with

Sterigmatocystis lutea, serious lesions are produced in various parts of the body. This species of fungus appears to possess a very marked pathogenic power even higher than that of *Aspergillus fumigatus*.

The treatment of trypanosomiases, A. Laveran and A. Thiroux (*Ann. Inst. Pasteur, 22 (1908), No. 2, pp. 97–131*).—A number of arsenical preparations were used in the treatment of guinea pigs artificially inoculated with trypanosomes, chiefly *Trypanosoma gambiense*. A mixture of atoxyl and biniodid or bichlorid of mercury produced a cure in 3 out of 12 cases. Atoxyl alone appeared to be without any pronounced effect. Arsenious acid used alone gave variable results. The effect was more pronounced when the intervals between the doses were short. It appears to be best to administer arsenious acid by way of the mouth. Trisulphid of arsenic produced a cure in 6 out of 13 cases when used in a colloidal solution either as a hypodermic injection or administered by way of the mouth.

Experimental studies on tuberculosis, E. Levy, F. Blumenthal, and A. Marxer (*Centbl. Bakt. [etc.], I. Abt., Orig., 46 (1908), No. 3, pp. 278–285*).—The attempt has previously been made to find more or less indifferent substances in which tubercle bacilli could be gradually attenuated. The authors experimented with galactose, glycerin, and urea, tubercle bacilli subjected to the influence of these substances being tested for virulence by inoculation into guinea pigs.

It was found that tubercle bacilli are killed by maintaining them for 4 to 5 days in a 25 per cent solution of galactose when added at the rate of 5 mg. of bacteria per 4 cc. of the medium. After remaining 1 day in a concentration of 5 mg. bacteria per 4 cc. of an 80 per cent solution of glycerin, tubercle bacilli were so attenuated as not to be pathogenic for guinea pigs except in large doses. In a 25 per cent solution of urea the tubercle bacilli, when added at the rate of 5 mg. per 4 cc. of the solution, lost their virulence completely after 2 days.

Tuberculous infection through the alimentary canal, M. P. Ravenel and J. Reichel (*Jour. Med. Research, 18 (1908), No. 1, pp. 1–18*).—In order to test the power of tubercle bacilli to penetrate through the walls of the alimentary tract, guinea pigs were inoculated with an emulsion of tubercle bacilli in doses of 2 cc. directly into the stomach. This method of procedure was adopted in order to avoid infection of the cervical lymph glands.

Tuberculous lesions were found generally distributed in various organs, and in about 56 per cent of cases the tubercle bacilli reached the lungs within 24 hours after introduction into the stomach. While the results obtained from these experiments are not considered sufficiently positive to exclude the possibility that infection may have taken place through the blood to some extent, yet the distribution of the lesions convinced the authors that the bacilli passed through the alimentary tract.

Tuberculous infection and the diagnosis of this disease, S. Arloing and L. Thévenot (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 11, pp. 561–563*).—An invasion of tubercle bacilli may produce a latent infection which disappears without producing any lesions at the point of infection. The greater or less limitation of the anatomical signs of infection depends upon the virulence of the bacilli and the relative immunity of the animal. Since the primary lesions of tuberculosis may be very slight, it is easy to understand that an experimental diagnosis by means of tuberculin may be depended upon as reliable even in the absence of readily detected post-mortem lesions.

The susceptibility of mammals to tuberculin, A. Marie and M. Tiffeneau (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 11, pp. 501, 502*).—New-born animals endure an extremely large dose of tuberculin administered hypodermic-

ally. If healthy rabbits are injected with tuberculin and receive a second dose within 17 hours the second dose like the first is without any injurious effects.

The simultaneous application of tuberculin by the hypodermic, ophthalmic, and cutaneous methods, U. Selan (*Clin. Vet. [Milan], Sez. Prat., 31 (1908), No. 12, pp. 195–198*).—A tuberculin test was made on 22 cattle, to which the three methods of using tuberculin were applied simultaneously. The hypodermic method gave reliable negative or positive results according as the animal was free from or affected with tuberculosis, the cutaneous and ophthalmic methods, on the other hand, being negative in all cases.

Ophthalmo and cuti-reaction in bovine tuberculosis, Garth, Kranich, and Grünert (*Deut. Tierärztl. Wchnschr., 16 (1908), No. 14, pp. 197–202*).—In testing the ophthalmo-reaction and cuti-reaction to tuberculin the authors found that no reaction could be obtained unless a strong tuberculin was used. It also appeared to be necessary to proceed with unusual caution, otherwise the experiment was in all cases doomed to failure.

The cutaneous and conjunctival reaction to tuberculin, H. Wildbolz (*Berlin. Klin. Wchnschr., 45 (1908), No. 11, pp. 545, 546*).—The experiments reported in this paper were made on rabbits, which the author believes to be better adapted for experimental tests with tuberculosis than are guinea pigs. The conjunctival reaction was in all cases of shorter duration than the cutaneous reaction. The former reached its maximum after about 8 to 10 hours and disappeared after 48 hours. The cutaneous reaction reached its highest point on the second or third day and persisted for 4 or 5 days.

The specific value of conjunctival reaction to tuberculin, F. Arloing (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 15, pp. 722–724*).—In the experiments carried on by the author it appeared that the conjunctival reaction to tuberculin is not specific. When tuberculin was instilled into the eye 6 hours after an injection of diphtheria toxin a pronounced general reaction took place with all of the usual symptoms observed in a positive tuberculin test.

The increased susceptibility to tuberculosis as a result of tuberculin injection, A. Slatineano and D. Danielopol (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 9, pp. 418, 419*).—In experiments with guinea pigs it was found that no increased susceptibility to tuberculosis was apparent after the injection of tuberculin until 4 days had elapsed. On the fifth day a considerably increased susceptibility was apparent, the guinea pigs developing very acute and generalized cases of tuberculosis when inoculated with virulent tubercle bacilli 5 days after the tuberculin injection.

The passage of tubercle bacilli into the milk, A. Coquot (*Bul. Soc. Cent. Méd. Vét., 85 (1908), No. 6, pp. 146–152, fig. 1*).—Tubercle bacilli were introduced directly into the mammary artery of a cow and this cow was later slaughtered and examined with reference to the possible location of the tubercle bacilli. Soon after inoculation the milk was examined at frequent intervals to determine whether tubercle bacilli had passed into it. The temperature of the animal was somewhat elevated by the inoculation but no inflammation occurred in the udder. Milk drawn from the udder under careful aseptic precautions was used in inoculating guinea pigs but proved in every instance not to be tuberculous.

The milk of reacting but not clinical cases of tuberculosis in cows, R. Ostertag (*Ztschr. Fleisch u. Milchhyg., 18 (1908), No. 7, pp. 205–211*).—The results obtained by various investigators in studying the milk of cows which react to tuberculin but do not show clinical signs of tuberculosis are critically reviewed by the author and a brief account is given of experiments recently undertaken by him along this line. The milk of 18 reacting cows was inoculated into guinea pigs without producing any result and similar negative results

were obtained from inoculating pigs and feeding calves. These experiments were continued for 2 to 5 months.

Similar negative results were obtained by Müller with the milk of 9 cows, Ascher with the milk of 7 cows, and Stenström from 50 cases. The author concludes that the milk of cows that merely react to tuberculin but do not show clinical symptoms of the disease does not contain tubercle bacilli. The proper means of preventing the infection of milk with tubercle bacilli is to eliminate all cases of mammary tuberculosis and other clinical cases.

Tubercle bacilli in the milk of tuberculous cows, D. A. de Jong (*Centbl. Bakt. [etc.], 1. Abt., Orig., 46 (1908), No. 3, pp. 213–217*).—Many investigators have worked on the problem of determining whether it is possible to fix a limit in the progress of tuberculosis beyond which the milk becomes dangerous. The author considers it desirable to secure fresh evidence on this point. Of the 11 cows upon which he made experiments, 1 showed clinical symptoms of tuberculosis, while in the other 10 the disease could not be diagnosed except by the use of tuberculin, yet in 3 of the 10 reacting cows the milk contained virulent tubercle bacilli. The conclusion is therefore drawn that in order to be on the safe side it is necessary to exclude the milk of all tuberculous cattle.

The frequency of tubercle bacilli in the market milk of the city of Washington, D. C., J. F. Anderson (*Jour. Infect. Diseases, 5 (1908), No. 2, pp. 107–115*).—Noted from another source (E. S. R., 19, p. 1175).

Combating tuberculosis by control of dairy by-products, H. Martel (*Indus. Lait. [Paris], 33 (1908), No. 9, pp. 135–145*).—Statistics are presented showing the percentage of tuberculosis among hogs and other animals which are fed on dairy by-products with or without previous sterilization. The importance of sterilizing such by-products is clearly indicated by these statistics. It is recommended that all dairy by-products be sterilized before being used.

Chronic pseudotuberculous enteritis in cattle, Bugge and W. Albien (*Berlin. Tierärztl. Wchnschr., 1908, No. 10, p. 175*).—The author's report that in a study of chronic enteritis of cattle they have at last isolated pseudotubercle bacilli and have shown that the disease is not a form of tuberculosis. A further study will be made of the subject as a basis for a more complete report.

Chronic bronchitis and broncho-pneumonia in cattle, L. Reisinger (*Monatsh. Prakt. Tierheilk., 19 (1908), No. 5–6, pp. 193–225, figs. 3*).—*Bacillus pyogenes* appears to become associated secondarily with this disease or becomes more virulent when the mucous membrane of the bronchi is affected injuriously by irritants of various sorts. While *B. pyogenes* is to be considered as a secondary rather than a primary cause of the disease it nevertheless produces during its development specific tissue changes by which the disease is characterized.

The Koopmansfontein lamziekte experiment, J. Spreull (*Agr. Jour. Cape Good Hope, 32 (1908), No. 3, pp. 289–300, figs. 6*).—Cattle selected for experimental purposes were divided into a number of different lots which received different treatment for the purpose of determining the effects of such treatments upon the development of lamziekte. Some of the cattle were given access to a salt lick, others received bone meal, and still others tar or ashes. The disease is believed by the author to be of a bacterial nature, but the use of bone meal is of great benefit in preventing its development.

A practical method of determining the dose of serum required to protect contact animals in outbreaks of rinderpest, G. K. Walker (*Jour. Trop. Vet. Sci., 3 (1908), No. 1, pp. 28–32*).—It usually requires much tact on the part of veterinary officers to put in operation any system of vaccination against rinderpest among cattle belonging to ignorant natives. Some experiments have

been carried on to determine roughly the size of the dose of serum to be used in the field in preventing the development of rinderpest in cattle which have been exposed to the disease. It is estimated that in outbreaks where the mortality is less than 50 per cent before inoculation, hills animals be given the standard dose for plains animals. If the mortality is between 50 and 75 per cent the dose for plains animals is to be doubled and if the mortality exceeds 85 per cent the dose should be 18 times that recommended for plains animals. During the past 5 years the number of animals inoculated has ranged from 17,000 to 84,000, while the number of animals which have died after inoculation has ranged only from 2 to 35.

Enzootic enteritis of calves and serum therapy, I. Sacchini (*Clin. Vet. [Milan], Sez. Prat., 31 (1908), No. 10, pp. 165–169*).—In certain localities enteritis of calves appears in enzootic form and causes serious losses. The extent of the injury from this disease depends somewhat upon the time of year and considerable difference is also observed in the susceptibility of individual calves. A serum treatment has been devised by the author which gives fairly satisfactory results.

Septic pneumonia of calves, Schreiber (*Tierärztl. Zentbl., 31 (1908), No. 8, pp. 116–118*).—Septic pneumonia is due to a micro-organism which so very closely resembles that of swine plague that when inoculated into swine it produces an infection scarcely to be distinguished from it. The use of a curative serum within 8 to 14 days after the appearance of the disease has given satisfactory results.

Stomach worms in calves, J. M. Moras (*An. Soc. Rural Argentina, 41 (1907), No. 53–54, pp. 181–187*).—Brief notes are given on the distribution of stomach worms, particularly *Strongylus ostertagi* in Argentina, and on the injurious effects which they produce in young calves. The symptoms and means of diagnosis are briefly described. As a means of combating the disease the author recommends the use of a vermifuge containing 5 gm. male fern, 1.5 gm. creosote, 3 gm. thymol, and enough alcohol and gum arabic to dissolve and emulsify the thymol. This mixture is then diluted in 200 gm. of water.

The warble fly. Experiments on cattle as to its treatment and life history, G. H. Carpenter and J. W. Steen (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 2, pp. 227–246, pls. 2*).—The life history of the warble fly was carefully followed through by the authors and a series of experiments was carried on with the carbolic dip, train oil and tar, kerosene emulsion, and other similar mixtures to determine the possibility of controlling this pest by spraying the cattle. It was found that the various insecticides which have been recommended for preventing egg laying by the warble flies are practically valueless. Some of them, such as train oil, spirits of tar, and sulphur, are not only useless but harmful to the skin. In Ireland *Hypoderma bovis* is the common species, *H. lineata* being very rare. The eggs are laid mostly on the legs and may be licked off by the cattle, after which they hatch and the young larvæ penetrate through various organs reaching their final location under the skin. Careful experiments in muzzling calves, however, showed that the larvæ may bore directly through the skin.

Since all of the insecticides proved useless the authors recommend that the maggots in the skin of infested animals be destroyed in the winter and spring. It is believed that a united effort along this line would exterminate the warble fly within a period of 3 years.

Report upon the eradication of the cattle tick in Lincoln and Claiborne parishes, W. Newell and C. E. Mauldin (*Crop Pest Com. La. Circ. 21, pp. 4*).—Attention is called to the benefits which will accrue to the cattle raisers of Louisiana from the eradication of cattle ticks. The work which has already

been done through the cooperation of the Bureau of Animal Industry of this Department with State authorities is regarded as very encouraging.

Studies on Malta fever among Algerian goats in 1907, E. Sergent, V. Gillot, and G. Lemaire (*Ann. Inst. Pasteur, 22 (1908), No. 3, pp. 209–216, figs. 2*).—During the season of 1907 the milk of 609 Algerian goats was carefully examined. In 26 of these animals the milk agglutinated *Micrococcus melitensis*, although the micro-organism was not found in the milk except in 2 of the 26 cases. Malta fever, therefore, appears to prevail among Algerian goats to the extent of 4.2 per cent as compared with 30 to 50 per cent among the goats of Malta.

Immunization of swine against hog cholera, J. W. Connaway (*Missouri Sta. Circ. Inform. 29, pp. 22, figs. 8; Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 97–119, figs. 8*).—This is an address delivered at the first annual meeting of the Missouri Swine Growers' and Breeders' Association. A general account of the disease is followed by a report of experiments on methods of immunizing swine, that have been conducted in cooperation with the Bureau of Animal Industry of this Department.

Pigs injected simultaneously with 20 to 30 cc. of serum and 1 to 2 cc. of virulent hog-cholera blood were found to be largely immune when exposed to the natural disease or fed upon viscera obtained from hogs that had died from a natural infection of cholera. Serum obtained from animals that following recovery from the disease had been fed upon infected viscera was found to have some power to protect against the disease, but its potency was not as great as the serum obtained from animals hyperimmunized by the injection of a large amount of infectious blood. "Our observations show that the serum is not effective when inoculated into an animal which is showing symptoms of the disease, but it shows a very high protective value in preventing the development of the disease. . . . In practical work in the field we hardly think that it is necessary, where animals are already exposed to the disease, to resort to the inoculation of the virulent blood."

Hogs that have been shown at State fairs should be placed in temporary quarantine for several weeks before returning them to the general herd. The liberal use of quicklime for disinfecting the grounds and the dipping of the hogs that have been exposed in any of the carbolic dips in general use are recommended as means for preventing the spread of the disease.

Borna horse disease, Liebener (*Berlin. Tierärztl. Wchnschr., 1908, No. 11, pp. 197–202*).—The literature relating to this disease is briefly reviewed and notes are given on the prevalence of the disease in various localities. As a rule treatment is without any avail. Slightly beneficial results have been obtained by the author from the administration of calomel and the application of ice packs to the neck. No benefit is derived from blood letting. The disease may be best controlled by careful destruction of carcasses and disinfection of stalls and all infected material.

The introduction of glanders with English horses, B. Bang (*Maanedskr. Dyrlæger. 19 (1908), No. 11, pp. 430–437*).—Among 29 English horses of good form and apparently in normal health the author found upon their arrival in Denmark that 7 were affected with glanders and 4 of them soon showed clinical symptoms. The animals had already been passed as healthy by an inspector. Attention is called to the necessity of exercising more care in the inspection of horses imported from other countries.

A preliminary report on some diseases of chickens, H. J. Milks (*Louisiana Stas. Bul. 108, pp. 3–11, pls. 4*).—Enterohepatitis of chickens previously reported from the New England, Middle, and Western States has been found by the author in several widely separated localities in Louisiana. Although thus far

found only in chicks under 6 weeks of age it is evidently quite common in the State. The course of the disease is quite rapid with a mortality of from 30 to 50 per cent of the chicks hatched. The report given is based upon an examination of 17 chicks. The author describes the symptoms and post-mortem appearances, and gives a complete account of a typical case. The causative organism is thought to be closely related to if not identical with the organism described by Smith (E. S. R., 7, p. 524), as *Amœba meleagridis*. Remedies previously suggested by the Bureau of Animal Industry of this Department (E. S. R., 19, p. 988) are discussed.

A bacterial disease was discovered in a flock where it was very fatal to chicks under 5 or 6 weeks of age. The course of the disease is said to have been very rapid, chicks dying during the night without previously having shown signs of illness. The symptoms and results of post-mortem and microscopic examinations are reported accompanied by a description of the organism. Two chicks and one of three mice died when inoculated with cultures of the organism.

The action of the aggressin of fowl cholera, E. Weil (*Arch. Hyg., 65 (1908), No. 2, pp. 81–106*).—The aggressin isolated by the author from cases of fowl cholera produces a striking susceptibility when inoculated into fowls. Control birds resisted a dose of virus ten times as great as was required to kill fowls previously treated with the aggressin. The aggressin, however, seems not to possess any toxic properties, since no injurious effects were produced in the experimental animals by increasing the dose eight times. A brief bibliography relating to this subject is appended to the article.

Fowl plague with special reference to its pathological anatomy, Freese (*Deut. Tierärztl. Wchnschr., 16 (1908), No. 12, pp. 173–177*).—Fowl plague is known to affect chickens, turkeys, guinea fowl, pheasants, geese, and sparrows. The lesions of the disease resemble those produced by poisoning with phosphorus. It is to be distinguished from fowl cholera by the presence of hemorrhages under the epicardium, an exudate in the pericardium, and intense enteritis in the case of the latter disease. Until recently no good evidence has been obtained in Germany that this disease affects geese. A number of cases of spontaneous infection were noted.

Studies and micro-photographs of the pathogenic protozoa, T. von Wasielewski (*Studien und Mikrophotogramme zur Kenntnis der Pathogenen Protozoen. Leipsic, 1908, pt. 2, pp. 175, pls. 8, figs. 26*).—A detailed account is given of the distribution of animal parasites in the blood in Germany. The author had occasion to study these parasites in material obtained from birds and mammals. Particular attention is given to Filaria, trypanosomes, hemagregarines, Plasmodium, especially the species found in birds, Hemoproteus, and Leucocytozoon. The blood parasites which cause plasmodiosis of birds were followed through 45 generations.

Animal parasites, E. Perroncito (*Ann. R. Accad. Agr. Torino, 49 (1906), pp. 3–17*).—Parasitism of young pigs with *Rhabdonema strongyloides* is sometimes so excessive as to cause death. Notes are given on fatal infestation with these parasites. The lungs, heart, pleura, and peritoneum showed no lesions. Brief notes are given on sanitary methods of preventing reinfestation with these parasites.

A study was made of multilocular echinococci in sheep. These parasites appear to be very common in sheep according to the author's experience. A form of cachexia is described caused by fluke worms and accompanied with jaundice. In cases of excessive infestation it is held that anemic and cachectic conditions often develop.

RURAL ENGINEERING.

Road materials of southern and eastern Maine, H. Leighton and E. S. Bastin (*U. S. Dept. Agr., Office Pub. Roads Bul. 33, pp. 56, pls. 3, map 1*).—This bulletin, prepared in cooperation between the U. S. Geological Survey, the State Survey Commission of Maine, and the Office of Public Roads, is the first of a series having in view the description, location, and testing of available road materials in the different States.

In Maine the area reported upon did not include the northern part because of its sparse population and the relative unimportance of the road problem. The principal source of road material in the area reported upon is stated to be the gravels, but owing to their great abundance and irregular distribution an extensive study of these could not be included except in those cases where detailed studies have already been made. The bulletin is especially devoted to road materials located near the large cities and to deposits favorably situated as regards shipment.

After a brief discussion of the general geology of the section and an outline of the methods used in testing the various specimens of rocks, the materials are described and discussed, grouped (1) according to variety and (2) according to localities with the varieties common to each.

Specifications and notes on macadam road construction, A. N. Johnson (*Engin. News, 60 (1908), No. 19, pp. 489–492*).—This is a paper read before the Western Society of Engineers, October 21, 1908.

The author, who is Illinois State highway engineer, expresses radical views on the construction of macadam roads, chief among which is that of using the large-sized stone for a wearing surface. He recommends that the first course of macadam should consist of broken stone from ¾ to 1½ in. in size, thoroughly raked and harrowed so that all the small particles will reach the bottom, because, since this is the state of stable equilibrium, the roller will compact it more readily. Also, in badly drained roads, if the smallest pieces are at the bottom the ground surface is less likely to be disturbed when the frost comes out of the ground. He believes there is no valid reason for bonding the lower course, but it should be thoroughly and slowly rolled to lock the pieces together. If the voids are filled with fine material this locking can not be obtained.

The second course should consist of a layer of 1½ to 3-in. stone having a Duval coefficient of wear of not less than 15, because this size will lock more firmly than a 1-in. and make the surface more resistant. The layer when consolidated should be 2 in. for a 6-in. road, or 4 in. for a 10-in. road. The larger the exposed pieces the greater will be the resistance to wear. Although the bottom layer may be of any kind of nonabsorbent, enduring material, the second layer should be more carefully selected.

The third course should consist of rock screenings containing all the dust, the sizes of these being from ¼ to 1 in., governed by the softness of the material. The screenings should be wet and rolled, and the second course so thoroughly rolled before screenings are placed on it that travel will not displace the pieces enough to allow the latter to pass through. In this paper the author observes that "the first place to give has been where there evidently has been a cluster of fine particles."

Macadam roads, A. B. Fletcher (*U. S. Dept. Agr., Farmers' Bul. 338, pp. 39, figs. 10*).—This is a condensed and revised edition of Bulletin 29, Office of Public Roads (E. S. R., 19, p. 386). It describes in some detail the essential features of the best practice of macadam road construction in rural sections with data as to costs. Standard details of construction used by the Massachusetts

highway commission and excerpts from the specifications for State-aid roads in that State are also included.

Highway improvement in Vermont, C. W. GATES (*Ann. Rpt. [Bd. Agr. Vt.], 28 (1908), pp. 67–72, figs. 8*).—In this report of the State highway commissioner there is an outline of Vermont's State-aid policies and notes on the improvements accomplished in the past year under them. The greatest mileage in the State-aided roads now consists of improved gravel roads with Telford foundation, and several of this type are illustrated.

Dust preventives, P. HUBBARD (*U. S. Dept. Agr., Office Pub. Roads Bul. 34, pp. 64, pls. 3, figs. 6*).—This bulletin is intended to furnish specific information concerning the materials and methods employed in dust prevention on all classes of roads. It is based on a review of all available literature supplemented by results secured from actual experiments conducted by the Office of Public Roads. Two general methods of attacking the dust problem are, (1) to apply material to hold down the dust, (2) to employ methods of construction designed to reduce its formation. This bulletin deals with the first method and the materials used are discussed in two classes: water, salt solutions and the lighter oils being considered temporary binders, and the tars, solid and semisolid materials, permanent binders. The bulletin concludes with a chapter on methods of examination and tentative specifications for the various preventives.

Irrigation in Mexico (*Bol. Soc. Agr. Mexicana, 32 (1908), No. 42, pp. 821–825*).—This article contains the terms of a contract recently let by the Mexican Government for the enlargement and construction of irrigation works including dams, canals, and reservoirs.

Yuma irrigation dam, D. A. WILLEY (*Sci. Amer., 99 (1908), No. 18, pp. 302–303, figs. 3*).—This describes some of the difficulties which presented themselves in this project and the way they were overcome, resulting in the successful control of a river which is liable to fluctuations of as much as 30 ft. in a week, and which flows through a channel of soft silt which has been accumulating for centuries.

A drainage system was considered necessary in conjunction with the irrigation works because of the flatness of the land and the high ground-water level, and consists of a main canal through the center of the irrigated areas, utilizing the natural drainage channels when possible.

A new scraper excavator (*Engin. News, 60 (1908), No. 18, p. 483, figs. 2*).—There is described a drag scoop bucket so designed that it will not "ride over" hard material. A heavy bail is rigidly attached to the side, which can, however, be set at various angles to the mouthpiece, thereby allowing the depth of cut to be gauged.

The applications of the motor in agriculture (*Auto. Agr. [Paris], 1908, No. 13, pp. 5–7, figs. 5*).—In this article the author briefly discusses the requirements of practical motor traction engines, with an analysis of the forces involved. It is stated that special attention should be given to securing the best point of application of the power, as in most engines the greater part is required to transport the motor itself. In this respect machines fitted with drums have an advantage over those in which the plows are connected directly.

Traction motors (*Agr. Prat. Pays Chauds, 8 (1908), No. 67, pp. 288–297, figs. 4*).—Two types of gasoline engines, fitted with hoisting drums for hauling plows, etc., and two types of gasoline traction engines and their various applications are described, with tables showing the results of efficiency tests.

Traction culture machines, V. FRÉMIER (*Auto. Agr. [Paris], 1908, Nos. 11, pp. 5–9, figs. 10; 12, pp. 6–11, figs. 16*).—This is a series of articles describing the different types of engines which have been invented for machine cultivating,

with a view to illustrating the problems of their economical operation and the various methods which have been devised to solve them. The account includes machines operated by electric motors and by explosive engines, and those with fixed plows and with rotating plows geared to the motors.

Statistics of agricultural implements (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 4, pp. 129–153*).—Noted from another source (E. S. R., 19, p. 488).

Hydro-electric plants, M. RINGELMANN (*Jour. Agr. Prat., n. scr., 16 (1908), No. 40, pp. 433–440, figs. 5*).—This article describes several hydro-electric power plants in which the flow of small streams or brooks is used to generate light and power for rural homes. It contains data on the cost of installing and operating the equipment.

RURAL ECONOMICS.

The results of investigations on the returns in agriculture (*Ann. Agr. Suisse, 9 (1908), No. 2, pp. 33–72*).—This is a detailed report of investigations carried on cooperatively between the department of agriculture and farmers in Switzerland as to the gross and net returns derived from farms operated under different systems of management in 1906, the returns being compared with those secured during the preceding 5 years.

The average profits as ascertained from 230 holdings were: On farms up to 12½ acres in size, $21 per acre; from 12½ to 25 acres, $21.50; from 25 to 37½ acres, $17; from 37½ to 75 acres, $18; and from farms of more than 75 acres, $10.25 per acre. Nearly 80 per cent of the products raised on Swiss farms consisted of animal, dairy, and poultry products, an enormous quantity of such products being annually exported.

Six years of investigations concerning agricultural profits in Switzerland (1901–1906), J. R. BONHOMME (*Jour. Agr. Prat., n. scr., 16 (1908), No. 43, pp. 533–537*).—This is a review of the investigations noted above, with particular emphasis on the returns secured in 1906. See also a previous note (E. S. R., 20, p. 291).

Finnish agriculture, A. BORCHARDT (*Ber. Land u. Forstw. Ausland, 1908, No. 17, pp. 113, figs. 6, maps 2*).—This publication discusses the climate, population, production, consumption, and trade of Finland, and describes at some length the agricultural administration of the country, including cooperation, agricultural societies, agricultural laws, credit systems, systems of farm management, and the commerce in the different farm products.

Agriculture in Portugal, C. DE MELLO (*Rev. Gén. Agron., n. scr., 3 (1908), No. 6–7, pp. 261–264*).—A description of the extent, geography, population, and agricultural production of Portugal is given in this article. Portugal is the most agricultural country in Europe. Of a population of 5,428,800 in 1900, 3,092,730 derived their living from agriculture, a ratio of 56.64 per cent, as compared with 55 per cent in Austria, 47 in France, and 34 in Belgium. The average size of holdings is 1.55 hectares (about 3.81 acres).

Agricultural Hungary (*Budapest: Gort., 1908, pp. VII+136, figs. 66*).—This publication by the Hungarian minister of agriculture, in addition to general data on the extent of land, number and size of agricultural holdings, the ratio of the people engaged in agriculture, the division of the land according to classes of cultivation, and the kind and quantity of products raised, presents a detailed account of the agricultural industry in Hungary. Data are also included as to the government encouragement of agriculture by means of educational institutions, the establishment of scientific and experimental stations, legislation in behalf of agricultural laborers, water regulation, soil improvement, and agricultural administration.

The population of Hungary at the close of 1905 numbered 20,548,472, of whom 68.4 per cent were engaged in agriculture. The division of the land into the various forms of productive agriculture gives a total of 32,500,000 hectares, of which only 1,700,000 hectares, or 5.23 per cent, are unproductive.

Agricultural labor in Hungary. M. J. BERNARD (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 8, pp. 603–606*).—Notes on an article appearing in the *Revue de Hongrie* by Daranyi, minister of agriculture, which gives a brief history and discusses the present status of the agricultural labor problem in Hungary.

Among the more recent reforms mentioned are the sanitary construction of about 8,000 houses for farm laborers which the occupiers can purchase if so desired; the establishment of a government fund of a million crowns (about $242,500) to aid laborers in case of sickness, accident, incapacity for work, etc.; free service in finding places for farm laborers out of employment; and the awarding of a decoration of honor to the laborers who have been 40 years on the same farm. The tendency of these reforms has been to check rural depopulation in Hungary.

The agricultural labor problem. E. VON KAHLDEN (*Der Boden die Landwirtschaftlichen Verhältnisse des Prussischen Staates. Berlin, 1908, vol. 8, pp. 383–436*).—This is a general historical review of the development of farm labor conditions in Prussia presented in the expectation that a survey of past history would offer some solution of the present-day agrarian problem. The scarcity of farm labor is regarded as of first importance and in the solution of the problem both the farmer and the government are urged to cooperate.

The wages of agricultural laborers in Bohemia. K. M. HERGEL (*Wiener Landw. Ztg., 58 (1908), No. 81, pp. 799, 800*).—This article gives the daily, monthly, and yearly wages in money of male and female agricultural laborers in different districts of Bohemia, together with such other privileges as meals, clothing, lodgings, and social favors which increase to a considerable extent the economic value of the laborer's income. In some districts where the money wage is high and other privileges numerous the income of the farm laborer is equal or even superior to the income of factory and industrial workers.

Agricultural holdings bill, 1908 (*London: Govt., 1908, pp. III+28*).—The text of the law to take effect January 1, 1909, regulating the relations between landlord and tenant regarding compensation for improvements, damage by game, disturbance, and similar matters, is reported.

The legal status of agricultural cooperative societies. R. WORMS (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 7, pp. 494–502*).—The author shows by court decisions and other means what constitutes an "agricultural cooperative society" and what are the limitations of its functions to enable such an organization to reap the benefits of the laws enacted in France for the encouragement of agricultural credit and the exemption of small farmers from certain forms of taxation.

The purpose of the law relating to the organization and operation of agricultural cooperative societies. E. NAQUET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 40, pp. 406–414*).—The text of the law of June 15, 1908, is given and discussed with regard to its probable effects on the future successful operation of such organizations in France.

First fruits of cooperation in India. H. W. WOLFF (*Econ. Rev., 18 (1908), No. 2, pp. 154–157*).—The author points out the beneficial results accruing to the peasant class in India through the introduction and development of mutual agricultural credit banks during the past few years. The Raiffeisen system is believed to be best adapted to India. Among the results mentioned the following are most significant: Farmers have received higher prices for their products, the number of live stock has increased, wells have been dug, hus-

handry has been improved, discharged native soldiers have been assisted in the purchase of land, and the perennial burden of debt has been lightened and shifted from the extortionate money lender, whose charges range from 25 to 100 per cent, to the mutual credit village bank at rates of interest ranging from 5 to 6¼ per cent.

Cooperative credit in Bengal (*Indian Agr., 33 (1908), No. 11, pp. 326, 327*).—On June 30, 1908, the societies numbered 326 and the membership 11,076, the corresponding figures for June 30, 1907, being 165 and 6,903, respectively. The common objects of borrowing by the ryots are to pay off old debts and to purchase cattle. "The rate of interest offered by some of the societies is only 6 per cent, whereas the lowest rate charged by money lenders is 18.75 per cent and the most common rate is 31.25." The greatest need at the present time is said to be competent honorary organizers to assist the government in organizing and instructing the peasant class.

Agricultural credit. E. Carnaroli (*Riv. Internaz. Sci. Soc., 45 (1907), Nos. 179, pp. 373–401; 180, pp. 509–525*).—This article discusses the essential characteristics of agricultural credit and gives the status of the movement in Italy and foreign countries. An extensive bibliography is included.

Immigrants of the agricultural class in the Northwest Provinces. A. Blue (*Census and Statis. [Canada] Bul. 6, pp. XI+58*).—Statistics of agricultural immigration into Manitoba, Saskatchewan, and Alberta from January 1, 1891, to June 24, 1906, are reported and discussed, including data relating to the countries from which the emigrants came, the number of families and persons per family, the live stock per farm, and the extent of farm lands occupied and in crops per family in 1906. The immigrant families numbered 50,321, embracing 205,774 persons, and occupied 11,678,357 acres of land, of which 2,307,979 acres were in crops.

Government crop reports: Their value, scope, and preparation. C. C. Clark (*U. S. Dept. Agr., Bur. Statis. Circ. 17, pp. 7–16*).—This is an account of the origin and development of the system of collecting and issuing Government crop reports, the methods employed to secure accurate data, and the value of crop statistics not only to farmers but to commercial interests of every kind and class.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 10 (1908), No. 12, pp. 89–96; Sup., pp. 97–104*).—These numbers give the crop conditions in the United States and foreign countries, with statistics on the exports of durum wheat, range of prices of agricultural products, the acreage, production, and value of the principal farm crops of the United States in 1908, and the annual report of the Bureau of Statistics for the fiscal year 1907–8.

Farm bookkeeping. H. G. Lamb (*New York, 1908, pp. VIII+69*).—This is a book of instruction in double-entry bookkeeping intended particularly for practical use on the farm.

AGRICULTURAL EDUCATION.

Agriculture in the rural schools. Nellie B. Chisholm (*Mich. Farmers' Insts., Inst. Bul. 14, pp. 283–286*).—In this address before a Michigan county farmers' institute the author emphasized the demands of the new education as a preparation for life and pointed out ways in which the teaching of agriculture helps to meet these demands. Her point of view is epitomized in the statement that "what American agriculture needs more than anything else is that it become intellectualized, that it be made the purpose and object of mental as well as physical effort."

What can the public schools do to improve industrial conditions? J. E. WARREN (*Ann. Rpt. Bd. Ed. [Mass.], 71 (1906–7), pp. 243–252*).—The writer describes features of instruction in agriculture and domestic science in some schools of Massachusetts, and urges the extension of work of this kind among public schools.

The future of agricultural education in Michigan, F. W. HOWE (*Schoolmaster, 2 (1908), Nos. 6, pp. 307–312; 7, pp. 368–372*).—The writer describes the present facilities for teaching agriculture of different grades in Michigan and outlines plans for the further development of instruction in agriculture in the public schools of the State.

Form of organization for movable schools of agriculture, J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Circ. 79, pp. 3–8*).—Suggestions are given for the organization, equipment, and conducting of movable schools of agriculture as one of the means of disseminating agricultural information.

Report on the organization of forestry instruction in Sweden, U. WALLMO ET AL. (*Stockholm, 1908, pp. XI–429*).—A report of a committee of experts appointed by the Swedish Department of Agriculture in 1906. Brief statements are given of the organization of instruction in forestry in Denmark, Finland, Prussia, Saxony, Wurttemberg, Bavaria, Austria, Hungary, Switzerland, and this country, together with the sources of information.

Royal Horticultural School, Dahlem, J. KOCHS (*Ber. Deut. Pharm. Gesell., 18 (1908), No. 6, pp. 325–342, figs. 13*).—An illustrated description of the equipment and work of the school as embodied in the report of an inspection by the German Pharmaceutical Society.

Missouri Housekeepers' Conference Association (*Missouri Sta. Circ. Inform. 30, pp. 42, dgm. 1; Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 428–469, dgm. 1*).—This contains the constitution and proceedings of the first meeting of the Missouri Household Conference Association on January 7–10, 1908, including the following papers: Household Adjustment to Technical Development, by Miss Caroline L. Hunt; The Pure Milk Problem, by Mrs. Walter McNab Miller; The Revival of Missouri Handicrafts, by Mrs. F. H. Seares; The Present Crisis of the American Home, by Charles A. Ellwood; The Home—A Business Proposition, by Mrs. Emma Page Tracy; The Home Economics Movement, by H. J. Waters; The Inductive or Scientific Method of Teaching Cooking, by Miss Louise Stanley; and Home Economics, Why it Should be Taught in the Schools, and What it Includes in the University of Missouri, by Miss Edna D. Day.

Report of the committee on children's gardens for the year 1907, H. S. ADAMS (*Trans. Mass. Hort. Soc., 1907, II, pp. 227–251, pls. 2*).—There were 49 entries in 1907 for children's garden prizes offered by the Massachusetts Horticultural Society. Of these 28 were school gardens, 7 school grounds, and 14 children's home gardens. The report states that Smith, Mount Holyoke, and Wellesley Colleges now have courses in gardening which provide the proper foundation for school garden work. It also contains abstracts of addresses made at the Children's Garden Conference in Boston, December 14, 1907, school garden reports from Springfield and Roxbury, Mass., and home garden reports from the Marlborough School and Home Industrial Association, the Waltham Home Garden Association, the Reading Home Gardens, and the Fairhaven Home Gardens. The abstract of an address by A. C. Boyden, principal of the State Normal School at Bridgewater, contains suggestions for natural science gardens and their functions in school work.

Importance of school gardens and methods of proper management, P. EMERSON (*Ann. Rpt. N. H. Hort. Soc., 1 (1907), pp. 114–121*).—This is a discussion of the importance and value of school gardens as a factor in education.

School gardens, L. C. Corbett (*Florists' Ex., 26 (1908), No. 8, pp. 254, 255*).—A paper read before the convention of the Society of American Florists, at Niagara Falls, N. Y., August 21, 1908.

School gardens, W. T. Carter, Jr. (*Farm and Ranch, 27 (1908), No. 38, p. 3*).—Suggestions for school garden work in the country schools.

Possibilities for the teaching of household arts in the rural schools, Helena Pincomb (*School News and Pract. Ed., 22 (1908), No. 1, pp. 20–22, figs. 5*).—Suggestions for conducting household arts instruction in rural schools, and a list of desirable articles for equipment and their cost are given.

Teaching soils in the public schools, W. T. Carter, Jr. (*Farm and Ranch, 27 (1908), No. 37, pp. 3–5*).—The importance of teaching agriculture is urged, references to suitable literature and suggestions for securing equipment are given, and suggestive lessons concerning soils in relation to moisture and air, temperature, and fertility are outlined.

Agriculture in public schools, A. D. De Witt (*Schoolmaster, 2 (1908), No. 6, pp. 313–316*).—An outline is given of the course of study at the St. Louis (Mich.) High School, which includes instruction in agriculture during the second and third years.

One hundred experiments in elementary agriculture for California schools, R. O. Johnson (*San Francisco, 1908, pp. 42*).—The experiments given in this pamphlet are grouped under 2 headings, (1) the needs of the plants, and (2) supplying the needs of the plants. There are experiments to show the need of plants for water, air, warmth, light, carbon, nitrogen, sulphur, and oxygen, with supplementary exercises to illustrate the preparation of oxygen, hydrogen, nitrogen, limewater, and carbon dioxid. The experiments showing how to supply the needs of the plant illustrate osmosis, preparation of crude phosphoric acid, potash, and saltpeter, tests for acids, alkalis, and salts, percolation, capillarity, evaporation, transpiration in plants, the circulation of water in plants, and other physiological phenomena of plant growth.

Experimental studies of plant growth, B. M. Davis (*Miami Bul., 7. ser., 1908, No. 1, pp. 32, figs. 17*).—The writer has outlined suggestions to teachers and 42 experimental studies of plant growth to follow his exercises on The Soil and Its Relation to Plants (E. S. R., 19, p. 390). In this later series he takes up the germination of seeds and simple physiological experiments in the development of the seed grain, including such matters as the development of starch and sugar and tests for these substances, the absorption of carbon dioxid by the leaf, the giving off of oxygen, transpiration, and regions of growth in different parts of the plant. A list of materials and their cost is given.

Sheep, R. J. Kinzer (*Industrialist, Farmers' Inst. Ser., 1 (1908), No. 4, pp. 155–193, figs. 7*).—This article considers the breeds, feeding, care, and management of sheep under the following topics: Selecting a breed, including brief descriptions of the more common breeds in America, how to judge a sheep, general care and management, selection of quarters, breeding season, shearing, and care of the flock. There are also 2 contributed articles, viz, Sheep on the Farm, by John D. Marshall, of Walton, Kans., and Problems of the Sheep Industry in Kansas, by E. D. King, of Burlington, Kans., as well as score cards for sheep.

Study of birds and their economic value, W. L. Finley (*Leaflets Listing and Describing Birds of Oregon, No. 1, pp. 7, fig. 1*).—This is the first of a series of leaflets to be issued by the Oregon State biologist for the use of pupils in the public schools and others interested in nature study. It considers the following subjects: How to interest children, discrimination between useful and harmful birds, changes that affect bird life, how birds regulate outbreaks of

insect life, studying the food of birds, value of birds to agriculturist and horticulturist, and birds as natural resources.

The preparation of the seed bed, V. M. SHOESMITH (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1908), No. 1, pp. 4–12, figs. 12*).—Reasons for plowing and harrowing the land are given, and also some suggestions concerning methods.

Some nature biographies, J. J. WARD (*London and New York, 1908, pp. 307, pls. 13, figs. 195*).—Life histories of moths, butterflies, plants, and jellyfish portrayed largely by means of illustrations from photographs.

The garden book for young people, ALICE LOUNSBERRY (*New York, 1908, pp. 290, pls. 49*).—A popular account of the garden work of a boy and girl during one season.

Making hay, A. M. TEN EYCK (*Industrialist, Farmers' Inst. Ser., 1 (1908), No. B, pp. 43, figs. 4*).—Contains suggestions on cutting, curing, storing, baling, and marketing the hay crop, and plans for construction of hay sheds.

Weeds, V. H. DAVIS (*Agr. Col. Ext. Bul. [Ohio State Univ.], 3 (1908), No. 9, pp. 15, figs. 14*).—This elementary study indicates how weeds injure the farmer and how they spread by natural and artificial methods, and suggests methods of combating them.

MISCELLANEOUS.

Eighteenth Annual Report of North Dakota Station, 1907 (*North Dakota Sta. Rpt. 1907, pt. 1, pp. 86*).—This contains the organization list, titles of station bulletins and press bulletins issued during the year, a brief report of the director, departmental reports containing articles abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1907.

A circular of information concerning the New Hampshire Agricultural Experiment Station (*New Hampshire Sta. Circ. 6, pp. 15, figs. 10*).—This is a brief account of the organization, equipment, and lines of work of the station with a list of the publications available for distribution.

List of publications of the Rhode Island Agricultural Experiment Station, Kingston, R. I., available for distribution May 1, 1908 (*Rhode Island Sta. Bul. 128 App., pp. VII*).

Experiment Station Work, XLVIII (*U. S. Dept. Agr., Farmers' Bul. 334, pp. 32, figs. 2*).—This number contains articles on the following subjects: Plant breeding on the farm, sorghum for silage, dry rot of corn, starch from sweet potatoes, profits from tomato growing, the keeping of apples, weed seeds in manure, weed seeds in feeding stuffs, forage crops for pigs, market classes and grades of horses and mules, profitable and unprofitable cows, blackhead in turkeys, extraction of beeswax, and an improved hog cot.

NOTES.

Arizona Station.—The El Paso and Southwestern Railway Company has made an initial contribution to the station of $2,000 for dry farming investigations. A location has been selected in the Sulphur Spring Valley 18 miles north of Douglas on a tract representative of a large section which it is thought may be utilized for dry farming. The agriculturist is to have charge of the work.

F. C. Kelton has been appointed assistant engineer and entered upon his duties January 15.

California University and Station.—An agricultural and horticultural demonstration train was sent out through the Sacramento Valley, November 9–17, 1908, manned by a corps of about twenty lecturers and demonstrators from the university and station staff. The train received an enthusiastic reception, the lecture car frequently proving inadequate to accommodate those in attendance.

Connecticut College.—Howard D. Newton, assistant in chemistry at Yale University, has been appointed instructor in chemistry.

Illinois University.—The State Corn Growers' and Stockmen's Convention was held at the college of agriculture January 18–30, with a registration of 660, of whom 372 were young men under 26 years. In addition 95 women took the corresponding course for housekeepers.

S. A. Forbes, professor of zoology since 1884, has resigned the position, to take effect September 1, but will remain director of the State Laboratory of Natural History and State entomologist.

Purdue University and Station.—More than 800 farmers and about 100 farm boys attended the one-week course in agriculture at the university, beginning January 11, and there were over 100 farmers' wives and daughters in attendance at the corresponding course in domestic science. The State Corn Show was a special feature, with entries representing over 5,000 farmers and farmers' boys, many of whom were formally organized into corn clubs.

On January 14 occurred the dedication of the new station building recently completed at a cost of about $100,000. This is a two-story and basement structure of vitrified brick with Bedford stone trimmings and tile roofing and fireproof throughout. Its dimensions are 200 by 56 ft., with two wings with a width respectively of 100 and 80 ft., making it the largest and most complete building in America devoted exclusively to station work.

The dedicatory exercises were opened by President Stone of the university with a brief review of the legislative and executive history of the station. Director Goss followed with a paper discussing its past achievements and present needs.

The dedicatory address was given by Director W. H. Jordan, of the New York State Station, who took for his subject The Value and Function of an Agricultural Experiment Station. In this very suggestive address were discussed the function of the experiment station, the point of view which should dominate its organization, and the attitude which should be assumed toward it

by the farmers of its State in their demands upon it. Dr. Jordan stated that the primary and the chief product of an experiment station should be scientific truths that are a real addition to agricultural knowledge, resting on sound and adequate investigations and capable of application to the varying farm conditions in the State which it serves. The station worker should be, he believed, first of all a man of high scientific attainments. It was not regarded as essential that he be experienced in the art of agriculture, although "he should be familiar with the agricultural conditions and practices that relate to his particular field of investigation." He should be fundamentally a seeker after truth for truth's sake, keenly alive to his responsibility as a leader, and with a strong sympathy with the problems of the farm. The farmers of a State, he declared, are entitled to the utmost results possible, but there can not safely be coercion by insistence upon a time limit. Nor should the station be hampered by requests for popular instruction nor for formulating rules of farm practice for individual needs, although "the obligation of an experiment station to point the way to the application of knowledge to farm practice should be fully recognized and fully met." He believed that there existed in indiscriminate extension of public assistance in agriculture a possible danger of impairing individual or community initiative and responsibility. In his opinion most careful differentiation was necessary between the things which should be done for the farmer and those which he should do for himself.

Iowa College.—At the two-weeks' short course held at the college, beginning January 4, the total enrollment reached nearly 800, chiefly in live stock and grain judging. It had been expected that the holding of local short courses at twenty points in the State would lead to a diminution in the attendance, but the effect seemed rather to stimulate additional interest, all previous records being broken. Meetings were held during the course by several State agricultural organizations, and there were also a large number of demonstrations, lectures by well-known speakers, an exhibition of automobiles adapted to farm conditions, and a competitive judging contest.

W. H. Peters, assistant professor of animal husbandry, and F. G. Churchill, assistant in chemistry, have accepted appointments at the Manitoba College of Agriculture, the former as professor of animal husbandry and the latter as lecturer in soil physics.

Kansas College.—C. G. Elling, assistant animal husbandman, has resigned to accept a commercial position in Cuba.

Maine University.—The dedication of the new agricultural building took place January 20. The speakers included Hon. E. B. Winslow, of the board of trustees, Governor B. M. Fernald, State commissioner of Agriculture A. W. Gilman, State Superintendent of Schools Payson Smith, and Dean Hurd. The dedicatory address was by Dean Davenport of the Illinois University and Station, his subject being The Development of our American Agriculture, What It Is, and What It Means. In this address the vital public interest in a successful agriculture was pointed out, and the fundamental purpose of agricultural education and research was defined as the development of agriculture as a productive occupation and of the agricultural people as a numerous and important part of the social and political fabric. The details of this development were considered to consist in making agriculture profitable, productive, and permanent, the country both comfortable and beautiful, and its people broadly educated.

The new hall of agriculture is a three-story and basement brick structure of Tudor style, 100 by 63 ft., and costing about $50,000. In the basement are located an animal operating room, laboratories for veterinary science, forestry, soil chemistry, and soil physics, a photography room and rooms for the storage

of tools, apparatus, etc. The dean's offices are on the first floor, together with offices of the departments of animal industry and agricultural chemistry, the extension department and the library. On the second floor are located the departments of agriculture and forestry, the bacteriological laboratory, and the museum; and on the third floor are the offices and class rooms of the horticultural department, drafting rooms, and a large lecture hall. The various laboratories are fully equipped with water, gas, and steam, and the interior and the furnishings are in dark mission oak.

About 50 ft. to the rear of the agricultural building is the new stock-judging pavilion, octagonal in shape, and 50 ft. in diameter. This is also of brick and is of the same general style as the main building. The judging ring is 25 ft. in diameter, and is surrounded by seats in amphitheater style, with a seating capacity of about 350 people.

In connection with the dedicatory exercises a meeting was held of the New England Federation of Agricultural Students.

Massachusetts Station.—C. S. Pomeroy has resigned as assistant horticulturist to accept a position in connection with the field investigations in pomology of this Department.

Minnesota University and Station.—L. D. Niles has been appointed assistant in animal husbandry.

Missouri University and Station.—The Farmers' Week, held at Columbia under the auspices of the State Board of Agriculture during the week of January 4 was extremely successful, attracting an attendance of over 1,000. A large number of organizations participated in the meetings, including in addition to the College of Agriculture and the State Board of Agriculture, the State Board of Horticulture, Improved Live Stock Breeders' Association, Dairy Association, Butter Makers' Association, Corn Growers' Association, Sheep Breeders' Association, Swine Growers and Breeders' Association, Highway Engineers' Association, Jersey Cattle Breeders' Association, Bee Keepers' Association, Home Makers' Conference, and the American Breeders' Association.

The general exercises were opened by President A. Ross Hill of the university, former Secretary of Agriculture Norman J. Colman, and Dean Waters. Illustrated lectures were given by H. W. Mumford on Live Stock and Agricultural Conditions in Argentina and How They Affect the American Live Stock Industry, and by W. J. Spillman on Mendel's Law. C. A. Zavitz discussed the work of the Ontario Agricultural and Experimental Union, and Assistant Secretary of Agriculture W. M. Hays gave an address urging the betterment of general farm conditions and especially of rural schools. During the week practical demonstrations were given in soil, seed, and dairy work, stock and grain judging, and there were corn, fruit, and dairy products shows. In the Home Makers' Conference a Model Kitchen was on exhibition and an address was given by Miss Martha Van Rensselaer, of Cornell University, on What the State May Do for Farmers' Wives. An account of the meeting of the American Breeders' Association is given elsewhere in this issue.

R. J. Carr has been appointed assistant in animal husbandry, vice C. W. Rine, whose resignation has been previously noted.

Nebraska University.—The eighth annual joint meeting of the various State agricultural associations was held at the university farm January 18–22, the various organizations holding meetings including the Board of Agriculture, the Horticultural Society, the Veterinary Medical Association, the Dairymen's Association, Poultry Association, the Improved Live Stock Association, the Swine Breeders' Association, the associations of breeders of Poland China and Duroc Jersey swine and Red Polled, Aberdeen-Angus, and Shorthorn cattle, the Bee Keepers' Association, the Corn Improvers' Association, the Farmers' Institute

Conference, and the Home Economics Association. A large number of experts from several agricultural colleges and experiment stations and from this Department participated in the various programmes.

A special feature of the meetings was the dedication on January 19 of Home Economics Hall—a three-story structure of gray pressed brick, costing about $70,000. The dedicatory address was delivered by Mrs. Ellen H. Richards, of the Massachusetts Institute of Technology.

The short winter courses at the school of agriculture opened with an enrollment of about 250, making the total number of agricultural students in the university about 850, of whom 110 are in university courses in agriculture, forestry, and home economics, and the remainder in the school of agriculture.

North Carolina State Station.—Tait Butler, veterinarian and animal husbandman, resigned January 1 to become editor of *Southern Farm Gazette*, published at Starkville, Miss. C. D. Harris, assistant chemist and microscopist, has resigned to engage in commercial work. J. L. Burgess, formerly of the Bureau of Soils of this Department, has been appointed to conduct work in the study of leading southern crops, their improvement by selection and breeding and the adaptation of crops to type soils.

Ohio University.—A four-year course in forestry has been added to the curriculum and will be offered beginning with the next academic year.

The first annual State corn show was held at the university, November 23–25, under the auspices of the State Corn Improvement Association. In a corn-judging contest a number of trophy cups were offered by agricultural newspapers, the station director of cooperative experiments, a member of the station staff for the best record of management in raising field corn, and by the faculty of the college of agriculture for the best exhibit from high schools. At an evening session addresses were given by C. P. Hartley, W. J. Spillman, and A. D. Shamel of the Bureau of Plant Industry, and H. H. Johnson of the Bureau of Statistics of this Department, Governor A. L. Harris, J. E. Wing, C. W. Burkett, and others.

The first movable school of agriculture to be undertaken in the State was held at Paulding during the week of October 28, under the supervision of the extension department. The school was arranged for by the president of the local national bank and was very successful. A small fee was charged to defray expenses. There was an enrollment of 85 farmers.

Oklahoma College and Station.—The death is reported of F. C. Burtis, agriculturist and horticulturist in the college and station from 1900–1902, and agriculturist until 1906. Professor Burtis was graduated from the Kansas College in 1891, and served as assistant agriculturist in the Kansas Station prior to his Oklahoma appointment. In the course of his work in Oklahoma he outlined and developed the course in agriculture, assisted in establishing the short courses, and organized the college creamery.

Pennsylvania College and Station.—A better-farming train, manned by a corps of lecturers from the college and station staff, has been sent out over the Pennsylvania Railroad, traversing the southeastern part of the State. The train was a new feature in that section and attracted much attention both from farmers and the general public.

Rhode Island College.—In the announcement of the extension department of this college for 1909 the list of technical and popular lectures by members of the faculty has been increased to seventy-four, and covers nearly every phase of the college work. These lectures are available to associations of engineers and mechanics, granges, and other farmers' organizations and meetings of educational associations. The extension department also offers to conduct

correspondence courses on general fruit culture and gardening, and to advise with individuals concerning reading courses.

South Carolina College and Station.—The agricultural faculty and station staff have formed the Clemson Biological Club for which weekly meetings are contemplated. George G. Ainsley, of the Bureau of Entomology of this Department, has accepted the position of assistant professor of entomology in the college.

South Dakota College and Station.—The new school of agriculture is proving very popular, 107 students being enrolled for the first year's work.

The station has undertaken experiments with horses to determine the digestion coefficients of several of the new grains grown in the Northwest.

Utah College and Station.—Instead of the usual short winter courses for practical farmers, the college this year has held a two-weeks' round-up farmers' institute at the college, with W. L. Carlyle as a special lecturer on live stock. About 75 farmers attended this course and nearly all of the 250 regular students in agriculture availed themselves of its privileges. A farmers' institute train consisting of lecture and exhibition coaches has made a tour of the State, stopping at every town reached by the railroad. Domestic science and dairy work were made special features. The train was enthusiastically received, and in many places overflow meetings in halls and meeting houses were necessary.

E. H. Favor, assistant horticulturist, has resigned to engage in commercial work.

Vermont Station.—R. E. Vaughan, assistant horticulturist, has resigned to become instructor in agronomy and kindred subjects in the secondary school at Mount Hermon, Mass.

Virginia College and Station.—The better-farming special train sent out over the Norfolk and Western Railway by the college and station in cooperation with the State truck station, the tobacco substations, and the State department of agriculture, November 4–13, 1908, met with good success, about 5,000 people visiting the train. The initial enrollment in the farmers' short course is nearly 50, a large increase over the preceding year.

Washington College and Station.—A. G. Craig has resigned as instructor in horticulture in the college and assistant horticulturist in the station to engage in commercial work.

West Virginia University.—A six-day tour of the State by a better-farming special train aroused much interest. Fully 14,000 people visited the train, and in one small town 350 farmers were on hand in a pouring rain at 8:30 in the morning. In some towns the stores were closed and special meetings were held by the board of trade and other organizations in connection with the trip.

American Breeders' Association.—The fifth annual meeting of this association was held at Columbia, Mo., January 6–8, in conjunction with a large number of State organizations participating in the exercises of Farmers' Week. Addresses were delivered at the general sessions by Assistant Secretary of Agriculture W. M. Hays, on Plant and Animal Breeding and on Country Life Education, and by H. J. Webber on Simple Methods of Breeding.

The programme consisted largely of reports and papers submitted from the various standing committees. Its scope may be indicated by the following partial list of papers: The Elimination of Undesirable Vegetable Varieties, by L. H. Vaughan; Permanent Collection of Plants and Animals for Breeding Purposes, by David G. Fairchild; The Problem of Fixation in Cotton Hybrids, by R. J. H. De Loach; Some Cytological Aspects of Cotton Breeding, by W. Lawrence Balls; Methods of Breeding Alfalfa, by G. F. Freeman; Methods of Improving Alfalfa by Selection, by J. M. Westgate; A Pure-line Method in Corn Breeding, by G. H. Shull; Spontaneous Hybrids of Native Californian Trees, by W. L. Jepson; Practical Possibilities of Grafting and Budding Forest

and Nut Trees, by G. L. Clothier; The Elimination of the Gullied Hillside Through Tree Breeding, by J. R. Smith; Breeding Sorghum, by C. O. Townsend; Work Conducted by the United States Department of Agriculture in Breeding High Grade Strains of Sugar Beet Seeds and Testing Imported Varieties, by J. E. W. Tracy; Some Principles of Poultry Breeding, by C. B. Davenport; Natural *v.* Artificial Incubation in Poultry Breeding, by James Dryden; The Factor Hypothesis in Relation to Plumage Color, by C. B. Davenport; A Few Preliminary Experiments on the Effect of the Age of the Parents Upon the Vigor of Chickens, by Horace Atwood; Some Observations in Telegony, by E. H. Riley; Breeding Tobacco for High and Low Nicotine Content, The Relation of Nicotine to the Quality of Tobacco, by W. W. Garner; History of Zimmer Spanish Tobacco, by A. D. Selby; Tobacco Seed Separation, Selection, and Propagation, by D. P. Cooley; The Production of a New Strain of Tobacco and its Development, by J. B. Stewart; Maryland Tobacco Breeding Work, by D. E. Brown; Work on Tobacco Breeding in Kentucky and Tennessee for 1908, by W. H. Scherffius; Report on the Improvement of Filler and Wrapper Tobacco in Eastern Texas by Seed Selection, by W. M. Hinson; The Present Status of Apple Breeding in America, by S. A. Beach; Characteristic of Wealthy Apple Seedlings, by W. T. Macoun; Effect of Different Methods of Selection on the Fixation of Hybrids, by W. J. Spillman; What are Factors in Mendelian Explanation? by T. H. Morgan; Inbreeding and Degeneration, by C. B. Davenport; Influence of Food Supply on Variation, by H. H. Love; Bud Variations and Their Meaning, by H. J. Webber; A Plan for Breeding Swine, by D. A. Gaumnitz; Fundamental Principles of Successful Swine Breeding, by William Dietrich; Experiments on Living Birds to Determine Effect of Humidity on Coloration of Plumage, by C. W. Beebe; Propagation of Game Birds in Captivity, by Wallace Evans; A Statement of Necessary Changes in Game Laws in the Interest of Breeders, by D. W. Huntington; Genetic Laws Applied; Results with Hybridized Swine, by Q. I. and J. P. Simpson; Hybridizing the Virginia Deer, by J. W. Griggs; General Report on the Raising of Deer, by D. E. Lantz; and Another Mode of Species Forming, by Luther Burbank.

Among the committees submitting formal reports were the following: On Pedagogics of Breeding, E. Davenport; On Pure Bred Seed and Plant Business, by C. A. Shamel; On Breeding Roses, by W. Van Fleet; On Breeding Forage Crops, by C. V. Piper; On Breeding Nut and Forest Trees, by G. B. Sudworth; On Breeding Poultry, by C. B. Davenport; On Breeding Sheep and Goats, by W. C. Coffey; and On Eugenics, by David Starr Jordan. Many other reports and papers were also submitted and will be incorporated in the annual report of the proceedings, which it is hoped to issue at an early date.

The association adopted a resolution favoring the amendment of State game laws to permit the sale at all times of live game for propagation and the sale, except during the breeding season, of game reared in a wild state by breeders and farmers. Federal legislation was advocated in connection with the taking of the Thirteenth Census whereby in certain parts of the country data may be collected relative to heredity in man, and the committee on eugenics was authorized to prepare schedules for the purpose.

Officers were elected for the ensuing year as follows: Hon. James Wilson, Washington, D. C., president; William George, Aurora, Ill., vice-president; W. M. Hays, Washington, D. C., secretary; N. H. Gentry, Sedalia, Mo., treasurer; O. E. Bradfute, Cedarville, Ohio, chairman, and C. B. Davenport, Cold Spring Harbor, N. Y., secretary of the animal section; and H. J. Webber, Ithaca, N. Y., chairman, and N. E. Hansen, Brookings, S. Dak., secretary of the plant section.

American Society of Agricultural Engineers.—The second annual meeting of this society was held at the University of Illinois December 29 and 30, 1908.

Following an address of welcome by Dean Davenport, J. B. Davidson, of the Iowa College, gave the presidential address. In this he called attention to the remarkable extension of engineering features into agricultural work during the past decade through improved farm implements, farm buildings, field and sanitary drainage, and water supply, the securing and applying of irrigation water, and good roads, and emphasized the consequent need of instruction in agricultural engineering at the agricultural colleges. He also discussed the purpose and scope of the society, pointing out that all those engaged in farm-implement design and manufacture, architects of farm buildings, drainage, irrigation, and highway engineers, and related lines of work are eligible to membership.

E. W. Hamilton gave an account of the farm motor contest recently held at the Winnipeg Industrial Exhibition, and discussed the benefits of such competitions. E. A. White presented a paper on The Plow Contest. Pumping Machinery for Irrigation Purposes was discussed in a paper by H. M. Bainer, Ditch Excavating by Machinery by A. E. Miller, and the Economical Location and Arrangement of Farm Buildings by E. W. Hamilton. Some Pressing Agricultural Problems were discussed by M. L. King, who called attention to the need of special agricultural knowledge in the solution of many engineering problems.

As at the previous meeting, considerable attention was given to educational phases. W. M. Nye presented a paper entitled Should a Course in Farm Mechanics be Offered in Agricultural High Schools? J. F. Steward discussed Methods of Instruction in Farm Machinery as seen from the Manufacturer's Standpoint, and I. H. Bartholomew gave an address on The Relation of the Implement Manufacturer to the College Department of Agricultural Engineering.

An outline of a college course of study in rural engineering, as prepared by the committee on instruction in agriculture of the Association of American Agricultural Colleges and Experiment Stations, was submitted to the society and after discussion referred to a committee to confer with the committee of the association.

In an address on The Need for Work in Agricultural Engineering by the National Government, R. P. Teele, of this Office, outlined the methods and policies of this Department. It was pointed out that although buildings, implements, and machinery together represented over 25 per cent of the fixed capital of the farmer little was being done in this field. The plan of organization most desirable for carrying on such investigations was discussed, and a committee appointed to study the question and confer with the Association of American Agricultural Colleges and Experiment Stations.

Officers were elected as follows: President, J. G. Wynne, Madison, Wis.; vice-presidents, C. A. Ocock, of the Wisconsin University, and R. P. Teele, of this Office; secretary, L. W. Chase, of the Nebraska University; and treasurer, E. A. White, of the Illinois University. The third meeting of the society will be held at the Iowa College in December, 1909.

Proposed Association of Plant Pathologists.—At a meeting of plant pathologists held at Baltimore, December 30, 1908, in connection with the meetings of the American Association for the Advancement of Science, a temporary organization was effected by the election of the following officers: President, L. R. Jones, of the Vermont University and Station; vice-president, A. D. Selby, of the Ohio Station; and secretary and treasurer, C. L. Shear, of this Department; with J. B. S. Norton, of the Maryland College and Station, and B. M. Duggar, of the Cornell University and Station, as additional members of the council. The council is to consider matters relating to permanent organization and policy, and arrange for the next meeting.

American Forestry Association.—This association held its twenty-eighth annual meeting at Washington, D. C., January 13 and 14. Governor Curtis Guild, of Massachusetts, was elected president to succeed Secretary Wilson, of this department, who declined reelection. Among the resolutions adopted was one in advocacy of national legislation providing for instruction in forestry in agricultural colleges.

Necrology.—Dr. J. W. Fletcher, botanist and entomologist of the Central Experiment Station farm, Ontario, since 1887, died November 8, aged 56 years. Doctor Fletcher took a prominent part in securing the establishment of the Dominion experimental farms, and was also entomologist of the Canada geological survey. He was the author of numerous bulletins and other articles dealing with Canadian insect life and other scientific subjects. The January number of *The Ottawa Naturalist* contains a list of his extensive writings and many tributes to his life and work.

Charles Baltet, one of the foremost practical horticulturists and horticultural writers of France, died at his home at Troyes, November 24, at the advanced age of 78. For more than fifty years M. Baltet was intimately connected with the development and progress of French horticulture. He was the leading spirit in the founding of the National Horticultural School at Versailles, and always remained a friend to that institution. He was also well known in many countries through his numerous papers and treatises on various phases of practical horticulture, among which may be mentioned L'art de greffer, Traité de la culture fruitière commerciale et bourgeoise, and L'horticulture dans les cinq parties du monde. For the last-named work he received a prize of 10,000 francs from the National Society of Horticulture of France.

The death of the distinguished meteorologist, J. M. Pernter, at the age of 60 years, at Vienna, December 20, 1908, is announced. Doctor Pernter held the chair of meteorology and geo-dynamics in the University of Vienna and became director of the Austrian Central Meteorological Institute when J. Hann retired from this position to devote himself to special research. Doctor Pernter was well known for his work on meteorological optics and other phases of meteorological science, as well as for his work in developing the weather service of Austria. He also contributed to the discussion of the question of cannonading against hail. He organized and for several years presided over the International Meteorological Commission and was among the first to secure the establishment of a chair of meteorology in one of the higher institutions of learning.

George Nicholson, curator of the Royal Gardens at Kew from 1886–1901 and a prolific contributor to the English horticultural press, died September 20, aged 61 years.

The death is noted of Alexander Craw, since 1904 superintendent of entomology for the Hawaiian Board of Commissioners of Agriculture and Forestry, aged 58 years.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

CONTENTS OF VOL. XX, NO. 7.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XX. MARCH, 1909. No. 7.

At the semicentennial of the Michigan Agricultural College, President Roosevelt indicated a keen interest in the welfare of the people living on farms, especially as to their home surroundings and their social relations. In his address on that occasion he declared that "no farmer's life should lie merely within the boundary of his farm," and that under present conditions the problem of the farm is much more than the growing of wheat and corn and cattle. "The problem of production has not ceased to be fundamental but it is no longer final; just as learning to read and write and cipher are fundamental but are no longer the final ends of education. We hope ultimately to double the average yield of wheat and corn per acre; it will be a great achievement; but it is even more important to double the desirability, comfort, and standing of the farmer's life. . . . We must try to raise the average farm life, and we must also try to develop it so that it shall offer exceptional chances for exceptional men."

Concerning the relating of education to the people of the country, he declared that we should "seek to provide for the people on the farms an equipment so broad and thorough as to fit them for the highest requirements of our citizenship, so that they can establish and maintain country homes of the best type, and create and sustain a country civilization more than equal to that of the city."

That this thought was not a passing fancy was made evident by frequent reference to these matters by the President since his address. His interest in this subject found expression in his appointment last August of a special commission, known as the Commission on Country Life, to gather information and advice as a basis for recommendations to Congress. In making this appointment he said: "The farmers have hitherto had less than their full share of public attention along the lines of business and social life. There is too much belief among all our people that the prizes of life lie away from the farm. I am therefore anxious to bring before the people of the United States the question of securing better business and better living on the farm, whether by cooperation between farmers for buying, selling, and borrowing, by promoting social advantages and opportunities in the country, or by any other legitimate means that will help to make

the country life more gainful, more attractive, and fuller of opportunities, pleasures, and rewards for men, women, and children of the farms."

The President defined the field of the commission and his expectations in regard to it in the following terms: "I shall be glad if the commission will report to me upon the present condition of country life, upon what means are now available for supplying the deficiencies which exist, and upon the best methods of organizing permanent effort in investigation and actual work along the lines I have indicated. You will doubtless also find it necessary to suggest means for bringing about the redirection or better adaptation of rural schools to the training of children for life on the farm. The National and State agricultural departments must ultimately join with the various farmers' and agricultural organizations in the effort to secure greater efficiency and attractiveness in country life."

The commission consisted of Dean L. H. Bailey, of the New York State College of Agriculture, chairman; Mr. Henry Wallace, editor; President Kenyon L. Butterfield, of the Massachusetts Agricultural College; Mr. Gifford Pinchot, of the U. S. Forest Service; and Mr. Walter H. Page, editor. The commission met and adopted plans for its work the latter part of September. It appointed Dr. E. W. Allen, assistant director of this Office, to act as its executive secretary. Subsequently William A. Beard, of California, and Charles S. Barrett, of Georgia, were added to the commission.

The commission devoted itself principally to securing a consensus of opinion as to the actual conditions prevailing over the country with reference to the social and sanitary conditions surrounding life in the country, educational facilities, facilities for communication and for the conduct of business, farm labor and tenancy, cooperation in buying and selling, and similar matters; and to becoming familiar with the various agencies in a position to assist in promoting rural welfare. Its work was divided among the members, such subjects as the social and sanitary conditions of the farm home, problems of education, farm labor and tenancy, sociological problems, etc., being assigned to different members.

The purpose of the commission, as stated in the President's message to Congress transmitting the report of the commission, was "not to help the farmer to raise better crops, but to call his attention to opportunities for better business and better living on the farm." Agricultural production is, in the judgment of the President, being adequately provided for by other organizations, for, as he says, "the National Department of Agriculture, which has rendered services equaled by no other similar department in any other time or place;

the State departments of agriculture; the State colleges of agriculture and the mechanic arts, especially through their extension work; the State agricultural experiment stations; the Farmer's Union; the Grange; the agricultural press; and other similar agencies, have all combined to place within the reach of the American farmer an amount and quality of agricultural information which, if applied, would enable him, over large areas, to double the production of the farm."

A circular containing questions under twelve general heads was distributed widely over the country. About 550,000 copies of this circular were mailed, not only to the farmers themselves, but to men in contact with country life, members of agricultural organizations, business and professional men, and others. Copies were sent to the newspapers of the country, to railroad officials, a large number of bankers and business men, country ministers and physicians, women's clubs, village improvement societies, and rural delivery carriers. The questions contained in the circular were also extensively printed by agricultural and other papers, with invitation to write to the commission along the lines of the questions. About 116,000 replies to this circular were received, as well as a large number of independent communications.

The commission held public hearings of from one to three days' duration at thirty different places in the United States, which were attended by representatives from forty States and Territories. At the President's suggestion meetings to discuss country life questions were held in district schoolhouses in almost every State, and reports of the meetings were sent to the commission.

The commission finds that while in a general way the American farmer was never more prosperous or better off than he is to-day, "agriculture is not commercially as profitable as it is entitled to be for the labor and energy that the farmer expends and the risks he assumes," and "the social conditions in the open country are far short of their possibilities." The leading specific reasons for this condition are stated to be—

"A lack of knowledge on the part of farmers of the exact agricultural conditions and possibilities of their regions;

"Lack of good training for country life in the schools;

"The disadvantage or handicap of the farmer as against the established business systems and interests, preventing him from securing adequate returns for his products, depriving him of the benefits that would result from unmonopolized rivers and the conservation of forests, and depriving the community, in many cases, of the good that would come from the use of great tracts of agricultural land that are now held for speculative purposes;

"Lack of good highway facilities;

"The widespread continuing depletion of soils, with the injurious effect on rural life:

"A general need of new and active leadership.

"Other causes contributing to the general result are: Lack of any adequate system of agricultural credit, whereby the farmer may readily secure loans on fair terms; the shortage of labor, a condition that is often complicated by intemperance among workmen; lack of institutions and incentives that tie the laboring man to the soil; the burdens and the narrow life of farm women; lack of adequate supervision of public health."

The three great general and immediate needs of country life as summarized by the President from the findings of the commission are: "First, effective cooperation among farmers, to put them on a level with the organized interests with which they do business.

"Second, a new kind of schools in the country, which shall teach the children as much outdoors as indoors and perhaps more, so that they will prepare for country life, and not as at present, mainly for life in town.

"Third, better means of communication, including good roads and a parcels post, which the country people are everywhere, and rightly, unanimous in demanding.

"To these may well be added better sanitation; for easily preventable diseases hold several million country people in the slavery of continuous ill health."

The report of the commission states that the subject of paramount importance as developed by the inquiries of the commission is education. "In every part of the United States there seems to be one mind, on the part of those capable of judging, on the necessity of redirecting the rural schools. There is no such unanimity on any other subject. It is remarkable with what similarity of phrase the subject has been discussed in all parts of the country before the commission. Everywhere there is a demand that education have relation to living, that the schools should express the daily life, and that in the rural districts they should educate by means of agriculture and country life subjects. It is recognized that all difficulties resolve themselves in the end into a question of education." The commission is of the opinion that "the most necessary thing now to be done for public-school education in terms of country life is to arouse all the people to the necessity of such education, to coordinate the forces that are beginning to operate, and to project the work beyond the schools for youth into continuation schools for adults." The commission therefore suggests the establishment of nation-wide extension work. "The first, or original, work of the agricultural branches of the land-grant colleges was academic in the old sense; later there was added the great field of experiment and research; there now should be added the third coordinate branch, comprising extension work, without

which no college of agriculture can adequately serve its State. It is to the extension department of these colleges, if properly conducted, that we must now look for the most effective rousing of the people on the land."

The commission believes that the development of the best in country life is largely a question of guidance. "The exercise of a wise advice, stimulus, and direction from some central national agency, extending over a series of years, could accomplish untold good, not only for the open country, but for all the people and for our institutions.

"In the communities themselves the same kind of guidance is needed, operating in good farming, in schools, churches, societies, and all useful public work. The great need everywhere is new and young leadership, and the commission desires to make an appeal to all young men and women who love the open country to consider this field when determining their careers. We need young people of quality, energy, capacity, aspiration, and conviction, who will live in the open country as permanent residents on farms, or as teachers, or in other useful fields, and who, while developing their own business or affairs to the greatest perfection, will still have unselfish interest in the welfare of their communities."

The commission points out, and the President concurs in the conclusion, "that the most important help that the Government, whether National or State, can give is to show the people how to go about these tasks of organization, education, and communication with the best and quickest results. This can be done by the collection and spread of information." The President urges that "it is of the first importance that the United States Department of Agriculture, through which as prime agent the ideas the commission stands for must reach the people, should become without delay in fact a Department of Country Life, fitted to deal not only with crops, but also with all the larger aspects of life in the open country."

The work of this commission broadly emphasizes the need, hitherto chiefly felt within a comparatively narrow circle, of broadening the scope of our agricultural colleges and the State and National departments of agriculture. So far these institutions have directed their energies mainly toward stimulating agricultural production. The agricultural experiment stations are organized under Federal and State legislation which practically limits their work to the problems of production.

It is well that this is so. When the stations were established the time was not ripe for economic and sociological studies among rural people in the United States. If the stations had been permitted to engage in statistical or other general inquiries regarding agricultural conditions, it seems probable that their energies would have been

largely dissipated in ill-considered general studies. The prime necessity was to establish agricultural production on a rational and scientific basis. This great task was laid upon the stations and the National Department of Agriculture. The concentration of effort in this direction was most fortunate and has led to results of permanent and incalculable value. This work is yet far from completion, but the institutions for research relating to agricultural production are now firmly established, have won the confidence and support of the agricultural community, and so demonstrated their usefulness that public funds are liberally bestowed on their maintenance.

It is highly important that the stations and other agencies for such research should continue to be held strictly to this business. Accurate knowledge of the natural conditions governing agricultural production is the only sure basis for the permanent prosperity of agricultural communities. It would be most unfortunate if any movement should arise which would divert these research agencies from strict adherence to the program of close and accurate studies relating directly to agricultural production.

But it is equally clear that the time has now come for exact and comprehensive studies of the economic and social conditions of agricultural communities. The wisdom of agricultural production in any particular line is determined not only by the familiarity which producers may have with the requirements of the product as related to the natural conditions in their region but also by the economic conditions prevailing in or affecting this region. Whether New England or Oregon farmers would better engage in wheat growing or dairy husbandry will depend not only on their knowledge of soils, methods of culture, and varieties of wheat, but also on the cost and value of the crop, the state of the wheat market in this and other countries, and other economic conditions. This is obvious when we state it, but oftentimes in our zeal to promote agricultural research relating to production we have laid so much stress on the necessity for an accurate knowledge of the factors of production that we have produced the impression among agricultural people that if they only knew enough about the laws governing production they could successfully engage in any kind of agricultural pursuit despite the most unfavorable economic conditions. Such wrong conceptions have, for example, led many to imagine and deplore a decadence of agriculture in regions where changes in economic conditions were destroying certain agricultural industries and bringing in others which eventually at least will prove more satisfactory and remunerative. It was inevitable that grain growing should cease to be the predominant factor in eastern agriculture, but more prosperous agricultural communities will result when dairy husbandry and horticulture are more firmly established and wisely conducted. Grazing may be for a time

the most prosperous agriculture on our western plains, but why regret if the herdsman is supplanted by the irrigator?

And even when the importance of economic factors as related to agricultural production has been acknowledged it has too often been forgotten that agriculture is not likely to prove a satisfactory and attractive pursuit in any community, however favored as regards skill in production and success in buying and selling unless the social conditions are also favorable to country life.

The awakening of interest in the economic and social problems of agricultural communities which is bound to follow the inquiries of the Commission on Country Life will have only a transient effect unless it is succeeded by the establishment of permanent institutions for the study of such problems and the preparation of experts in these lines. When we consider the vast extent of our country and the varied character and environment of our agricultural people it can hardly be expected that any satisfactory solution of the complex economic and social problems of different regions can be reached until after many years spent in the most careful study of local conditions by thoroughly trained experts. At present we have neither the facts nor the experts.

To secure the experts it will be necessary to broaden the work of our agricultural colleges and build up in them strong departments of agricultural economics and sociology. A beginning has been made in this direction, but present provision for such studies is wholly inadequate. It seems likely that the same process of evolution must go on in these departments as has occurred in the departments for agricultural production. First, a few men will roughly block out the problems and attempt instruction on them. Then the need of research will be apparent, and fragmentary efforts will be made in this line. But the departments of instruction in agricultural economics and sociology will never be in satisfactory condition until agencies for systematic research in these lines are established and have done considerable work.

Herein lies a great opportunity for the National and State departments of agriculture and the agricultural colleges. It is the joint work of all these agencies which alone will secure the best results. The report of the Commission on County Life points out the path along which progress should be made in the immediate future. Our chief purpose here is to emphasize the importance of the work of this commission as related to our agricultural colleges. It will be well if these institutions follow closely the work of the commission and get ready to take up the work when the commission leaves it.

One factor in the present development of our agricultural colleges is of great importance in this connection. As is well known, these

colleges are now proceeding rapidly with the formation of departments for extension work. In this way they are being brought into much closer personal touch with the agricultural people. This is already giving the colleges a new and broader view of the problems of rural life. The varied human needs of agricultural communities and the dignity and worth of agricultural people are being borne in upon the colleges as never before. The movement for agricultural education is no longer a narrow and intellectual paternalism in which the few are condescending to advise the many. It is being more and more permeated with the spirit of comradeship and good fellowship in which all are uniting to advance a common cause. This drawing together of the institutions for agricultural education and the people should make it much easier to get at the real heart of rural economic and social questions and in the end exercise a profound influence toward their satisfactory solution.

That the great impetus which science has in recent years given to agriculture in the United States has also been felt in other American republics is shown by the activity which has been displayed in many of these countries in reorganizing old and establishing new agricultural institutions, by increased demand upon this country for men to take charge of these institutions, and by the large number of young men of these countries seeking advanced training in agriculture in the United States.

Evidence of the importance which science applied to agriculture is assuming in other American republics was furnished by the First Pan-American Scientific Congress recently held at Santiago, Chile, which was attended by representatives from all of the American republics except Haiti, and at which discussion of subjects related to agricultural education and research formed a prominent feature of the proceedings. A section of the congress was devoted exclusively to the consideration of such subjects, and steps were taken to make this feature even more prominent at the next congress, which is to be held at Washington in 1912.

It is believed that those in this country interested in the broad development of agricultural education and research and in extending and strengthening our scientific relations with other countries, particularly those of continental America, will find in this congress a valuable means to this end. Attention is therefore particularly called to the account of the Santiago congress which is given on page 695 of this number of the Record, and occasion is here taken to emphasize the importance of making the agricultural education and research features of the Washington congress worthily representative of the progress in these subjects in America and an incentive and aid to future development.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Annual reports on the progress of chemistry for 1907 (*Ann. Rpts. Prog. Chem. [London]*, *4* (*1907*), *pp. X+362, fig. 1*).—This is the fourth volume of this series of reviews of progress in chemistry issued by the London Chemical Society. As heretofore, it includes reports on general and physical chemistry by A. Findlay, inorganic chemistry by H. Marshall, organic chemistry by H. J. H. Fenton, C. H. Desch, and J. T. Hewitt, stereochemistry by H. O. Jones, analytical chemistry by A. C. Chapman, physiological chemistry by W. D. Halliburton, agricultural chemistry and vegetable physiology by A. D. Hall, mineralogical chemistry by A. Hutchinson, and radioactivity by F. Soddy.

The section on agricultural chemistry and vegetable physiology reviews investigations in soil bacteriology, chemistry, and physics; chemistry of the growing plant; manures and manuring; chemistry of animal nutrition; and chemical analysis. "The record of the year includes no notable discovery nor any paper that is likely to be reckoned in the future as of fundamental importance; in several directions, however, good progress has been made, although, as the subject opens up, it is only to disclose its increasing complexity."

General chemistry of enzyms, H. Euler (*Ergeb. Physiol., 6* (*1907*), *187–243*).—An important summary of data regarding enzyms. Such questions are taken up as classification, preparation, the influence of temperature on enzym activity, and the question of kinasins, ko-enzyms, or activators.

The data of geochemistry, F. W. Clarke (*U. S. Geol. Survey Bul. 330, pp. 716*).—"To bring some of the data together, to formulate a few of the problems, and to present certain general conclusions in their modern form are the purposes of this memoir. It is not an exhaustive monograph upon geochemistry, but rather a critical summary of what is now known and a guide to the more important literature of the subject." The different chapters treat of the chemical elements, the atmosphere, lakes and rivers, the ocean, the waters of closed basins, mineral wells and springs, saline residues, volcanic gases and sublimates, the molten magma, rock-forming minerals, igneous rocks, the decomposition of rocks, sedimentary and detrital rocks, metamorphic rocks, metallic ores, the natural hydrocarbons, and coal.

The determination of the equilibrium of ammonia under pressure, F. Haber and R. Le Rossignol (*Ztschr. Elektrochem., 14* (*1908*), *Nos. 45, pp. 181–196, pl. 1; 34, pp. 513, 514; abs. in Sci. Abs., Sect. A—Phys., 11* (*1908*), *No. 129, p. 538*).—This is a further contribution to the discussion of this subject which has been going on for some time between the authors (E. S. R., 19, p. 910) and Nernst and Jost. Further determinations are reported which confirm the author's previous results but do not agree with Nernst's theoretical calculations or the results obtained by Nernst and Jost at temperatures between 685° and 1040° F.

On the equilibrium weights of ammonia, F. Jost (*Ztschr. Anorgan. Chem., 57 (1908), No. 4, pp. 414–430, fig. 1; Ztschr. Elektrochem., 14 (1908), No. 28, pp. 373–375; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 129, pp. 537, 538*).—New measurements with the Nernst electric pressure furnace of the partial pressure of ammonia formed from nitrogen and hydrogen are reported. The conclusions of Haber and Le Rossignol are criticised.

On the constitution of phosphoric acid, F. C. Palazzo and F. Maggiacomo (*Gaz. Chim. Ital., 38 (1908), II, No. 2, pp. 115–123*).—A theoretical discussion.

The determination of phosphoric acid, N. von Lorenz (*Chem. Ztg., 32 (1908), No. 60, pp. 707–709; abs. in Chem. Abs., 2 (1908), No. 20, p. 2767*).—From a comparison of his method with the citrate method the author concludes that while the accuracy of the latter depends upon a compensation of errors the former gives directly accurate results. The author's method, moreover, is quicker, more convenient, more generally applicable, and does not require the previous removal of silica.

The determination of phosphoric acid by the von Lorenz method, O. Fallada (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Indus. Österr. Ungar., No. 202, pp. 7–10; abs. in Chem. Zentbl., 1908, II, No. 9, pp. 827, 828*).—Comparative tests of this method and of the Wagner molybdic and citrate methods on Thomas slag, spodium, and superphosphate are reported. The results indicate a high degree of reliability for the method.

Action of ammonium citrate on calcium phosphate, A. Barillé (*Jour. Pharm. et Chim., 6. ser., 27 (1908), No. 9, pp. 437–441; Ann. Chim. Analyt., 13 (1908), No. 7, pp. 264–266; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 548, II, p. 496; Chem. Zentbl., 1908, I, No. 26, p. 2130; Chem. Abs., 2 (1908), No. 17, p. 2354*).—Experiments with dicalcium and tricalcium phosphates show that both salts are soluble and that the solubility varies with their physicial condition. The author concludes that the ammonium citrate solution not merely dissolves the phosphates, but forms true double salts with them.

A simple method for the determination of potash in silicates. W. Autenrieth (*Zentbl. Min. u. Geol., 1908, pp. 513–517; abs. in Chem. Zentbl., 1908, II, No. 13, pp. 1125, 1126; Chem. Abs., 2 (1908), No. 22, p. 3038; Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 897*).—The silicate is reduced with hydrofluoric acid and sulphuric acid. The potash is precipitated with Koninck's sodium cobalti-nitrite reagent, but finally converted into either chloroplatinate or perchlorate and so weighed.

A short volumetric method for the estimation of sulphuric acid. T. Cooksey (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 216–218*).—A method based upon "the volumetric estimation of the excess of barium chlorid left in solution after precipitation of the sulphuric acid as sulphate of baryta" is described.

Mechanical and physico-chemical analysis of soil, F. Hiti (*Estac. Agr. Cent. [Mexico] Bol. 4, pp. 10*).—The methods proposed by Grandeau for this purpose are described.

The estimation of phosphoric acid in foods, E. Wörner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 12, pp. 732–734*).—In the method described by the author the food material is oxidized with nitric and sulphuric acids, the phosphoric acid precipitated with molybdate solution, and the precipitate heated with excess of standardized sodium hydroxid solution. Ammonia is thus expelled and its quantity as determined by titration is a measure of the phosphoric acid present.

The detection of pentoses by means of orcin hydrochlorate. J. Pieraerts (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 1–2, pp. 46–62*).—The results

of the author's extended study of methods were favorable to the use of orcin hydrochlorate.

Detection and estimation of rice husk in feeding stuffs, F. SCHRÖDER (*Arb. K. Gesundhtsamt., 28 (1908), No. 1, pp. 213–224; abs. in Analyst, 33 (1908), No. 388, p. 280*).—Rice husks may be detected by the microscope, but the quantity present must be determined before the feeding stuff can be said to be adulterated. This can be done by determining the ash and silica content. The author reports the percentages found in different brans.

The proteins of egg yolk, R. H. A. PLIMMER (*Jour. Chem. Soc. [London], 93 (1908), No. 550, I, pp. 1500–1506*).—A new proteid was identified in egg yolk for which the name livetin is provisionally suggested. "Vitellin and this new protein showed a very close similarity to one another, but they differ considerably from ovalbumin, and it may be concluded that this protein is another constituent of egg yolk. It is suggested that the protein may be vitellin without the phosphorous-containing portion."

Experimental and analytical data are reported.

The albumen of turkey egg white, W. WORMS (*Zhur. Russ. Fiz. Khim. Obshch., 38 (1906), pp. 597–607; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, pp. 363, 364*).—The author isolated and studied a crystalline albumen which is regarded as an isomer of the albumen in the white of hens' eggs.

The detection of protein by means of formaldehyde, L. VON LIEBERMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 4, p. 231*).—A note on the detection of protein by means of formaldehyde and concentrated sulphuric acid containing a little iron oxid.

Identification of different plant proteids by means of specific sera, D. GASIS (*Berlin. Klin. Wchnschr., 45 (1908), No. 7, pp. 358–360*).—Proteids from beans, lentils, peas, wheat, rye, barley, maize, beet seed, and rice were studied with bean, rye, rice, and beef antisera. The results, according to the author, show that plant proteids may be differentiated by the biological method when the proper quantitative relations are observed. The reaction is weaker or more pronounced according to the remote or near relationship of the different plant proteids used. In general, plant proteids are more readily differentiated by means of the precipitin reaction than are animal proteids. A bibliography is appended to the report.

The estimation of dry matter in gluten, M. P. NEUMANN and P. SALECKER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 12, pp. 735–738*).—Moist gluten is pressed to the bottom of a flat nickel dish and dried in an air oven at 120° C. Constant weight is obtained in 3 hours.

Saccharid substances, E. SILZ (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 1–2, 40–45*).—In a report presented at the First International Congress for the Repression of Adulteration of Foods and Drugs the author defines sugar and similar goods and outlines commercial procedures regarded as legitimate.

The inversion of cane sugar by invertase, C. S. HUDSON (*Jour. Amer. Chem. Soc., 30 (1908), No. 7, pp. 1160–1166*).—According to the author's conclusions which are based on experimental data "the inversion of cane sugar by acids follows, even in its first stages, the unimolecular order, and second. . . . the polarimetric measurement of the inversion of cane sugar by invertase involves a large source of error which can be avoided by adding alkali to the inverting solution before each reading of the polariscope.

Detection of δ-fructose in the presence of other natural sugars, M. J. PIERAERTS (*Rec. Cén. Agron., n. ser., 3 (1908), Nos. 5, pp. 218–227; 6–7, pp. 266–272*).—A critical study of methods.

The estimation of sugar in beet stalks and dried pulp, J. Robart (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 1–2, p. 65*).—A discussion of the methods advocated by Zlobinsky (E. S. R., 19, p. 810).

A reaction for the detection of natural and artificial honey, J. Fiehe (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 75–77*).—The test described is based on the detection by means of resorcinol and hydrochloric acid of the decomposition products formed during the manufacture of invert sugar from which artificial honey is prepared. With invert sugar an orange red color is obtained, changing to cherry red and then to brown red. Pure natural honeys do not give such a reaction though a transient pink coloration may sometimes be noted.

The rapid estimation of starch in sausage and other meat products, Telle (*Ann. Chim. Analyt., 13 (1908), No. 4, pp. 144–146*).—A modification of Baudry's method of estimating starch is described, which the author considers satisfactory.

Detection of horse meat in sausage, etc., Telle (*Ann. Chim. Analyt., 13 (1908), No. 4, pp. 143, 144*).—A note on methods of detecting horse meat.

Methods employed for the analyses of wines, alcohols, brandy, and liqueurs (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 5, pp. 522, 523*).—The French official methods in accord with the law of August 1, 1905, are briefly outlined.

A new method for the determination of fixed and volatile acids in wine and other fermented beverages, M. E. Pozzi-Escot (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 1–2, pp. 68, 69; abs. in Chem. News, 98 (1908), No. 2548*).—The fixed acids are precipitated as salts of barium. The volatile acids are determined by subtracting the fixed acids from the total acidity.

Citric acid in wine, M. A. Hubert (*Ann. Chim. Analyt., 13 (1908), No. 4, pp. 139–141*).—A discussion of the occurrence of citric acid in wine and its detection.

Note on the formation of formaldehyde in solutions of cane sugar and its bearing on Hehner's test for formaldehyde in saccharin mixtures, A. A. Ramsay (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 172–175*).—The author identified formaldehyde in aqueous solutions of cane sugar, boiled and distilled, and discusses the bearing of such results on the identification of added formaldehyde in food products.

Titration of formaldehyde in colored solutions, S. P. L. Sörensen and H. Jessenhansen (*Compt. Rend. Lab. Carlsberg, 7 (1908), No. 2, pp. 58–71*).—From the results of experimental studies on the determination of formaldehyde in gelatin, casein, egg albumen, and serum albumen, the authors conclude that solutions may be decolorized with nitrate of silver in a slightly acid solution without causing any considerable loss of nitrogen.

The detection of formaldehyde, F. von Fillinger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 4, pp. 226–231*).—A study of methods.

The identification and estimation of boric, salicylic, and benzoic acid in foods and condiments, W. von Genersich (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 4, pp. 209–225*).—A critical study of methods.

The detection of saponin, J. Rühle (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 3, pp. 165–171*).—A critical study of Brunner's method which the author considers satisfactory.

The valuation of saffron for dairy purposes, K. Teichert (*Milchw. Zentbl., 3 (1907), No. 8, pp. 369–374; 4 (1908), No. 3, pp. 108–111*).—The author outlines what he considers a more reliable method for the determination of the amount of coloring matter than is now in use. The methods for obtaining the percentage of moisture and ash are also given.

The preservation of milk samples for analytical purposes, K. Windisch (*Milchw. Zentbl., 4 (1908), No. 3, pp. 97–108; abs. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 17–19, pp. 577, 578*).—A list of reagents that have been used as preservatives is discussed and the literature cited. The author made a series of tests with potassium bichromate and copper ammonium sulphate, and presents tables showing the results obtained with varying amounts of these substances. Milk retained normal characteristics for 4 weeks with 0.15 to 0.25 per cent solution of potassium bichromate and 1.0 to 1.5 per cent copper ammonium sulphate. A 2 per cent solution of the latter preserved the milk a week longer. In summer months a stronger solution is needed than in the winter.

Rapid estimation of potassium bichromate in milk, Goutère (*Ann. Chim. Analyt., 13 (1908), No. 7, pp. 262, 263*).—This is accomplished by adding potassium iodid and hydrochloric acid to the ash, and determining the iodin set free by titration with sodium hyposulphite.

Contributions from the dairy institute of Greifswald. II, Studies on the Adams method of estimating fat, R. Eichloff (*Milchw. Zentbl., 4 (1908), No. 3, pp. 120–124*).—With sour milk exact results were obtained only by the use of fat-free paper.

An automatic device for measuring reagents used in determining milk fat by the Gerber method (*Apoth. Ztg., 23 (1908), No. 68, p. 607; Schweiz. Wchnschr. Chem. u. Pharm., 46 (1908), No. 40, pp. 638, 639, figs. 6*).—It is claimed that by two movements of the hand the amount of milk or of the reagents used in the Gerber method can be quickly and accurately measured.

A new automatic milk-measuring device, O. Wendler (*Milch Ztg., 37 (1908), No. 42, pp. 494, 495, figs. 3*).—Notes on the device noted above.

New apparatus for estimating the moisture content of butter (*Milch Ztg., 37 (1908), No. 41, pp. 485, 486, figs. 5*).—This is a special form of balance with a graduated arm. The sample of butter is weighed before and after heating to expel moisture. The percentage of moisture lost is easily computed from the scale.

Total solids in mill products by the refractometer, S. S. Peck (*Hawaiian Sugar Planters' Sta., Div. Agr. and Chem. Bul. 27, pp. 5–25*).—At this station 25 samples of waste or final molasses were examined for the purpose of comparing results obtained by desiccation and by the refractometer. Thirteen samples showed a larger amount of solids with the refractometer. The determination of total solids in 18 samples of various juices by the refractometer usually gave lower results than the Brix spindle. With 2 samples of massecuite the refractometer gave satisfactory results. "Under the present method of determining solids in the residual juice in the bagasse the refractometer finds no place. . . Boiling to a definite percentage of solids in the massecuite is possible by the use of the brasmoscope. . . The refractometer is an effectual substitute when boiling to string-proof and not as difficult of application. . . The refractometer offers a rapid and convenient method for checking the correctness of the graduations on Brix spindles." A table of dry substance from refractive index at 28° C., by H. C. Prinsen-Geerligs, is appended.

Refractometer in the control of sugar manufacturing processes, F. Strohmer (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Indus. Osterr.-Ungar., No. 206, pp. 13, figs. 5*).—From the experimental data reported the author concludes that the refractometer may be made of great importance in controlling sugar house processes.

A new soil sampler, W. H. Stevenson (*Science, n. ser., 28 (1908), No. 722, pp. 614–616*).—This is a brief description of a soil sampler fully described in a bulletin of the Iowa Station (E. S. R., 19, p. 709).

METEOROLOGY—WATER.

The weather service and meteorology in the United States and Canada. P. Polis (*Ber. Landw. Reichsamte Innern [Germany], No. 7, pp. 43, figs. 12, maps 2.*—This is an account of observations made during a trip to the United States and Canada during the summer and fall of 1907. The object of this trip was to study the organization of the meteorological service, especially the weather service, and the telegraphic and other methods of distributing information about the weather in the United States, with a view to improving the German weather service. The author states in conclusion that the organization of the weather service in the United States may be taken as a model and that its methods of distributing meteorological information, weather maps, and forecasts are the best in the world. He was particularly impressed with the rapidity with which the daily weather maps were prepared, printed, and distributed, and with the dissemination of the weather forecasts by means of telegraph, telephone, and weather signals.

Third annual report of the meteorological committee (*Ann. Rpt. Met. Com. [Gt. Brit.], 3 (1908), pp. 164, pls. 5, figs. 3*).—This consists as usual of administrative reports regarding organization and operations (during the year ended March 31, 1908) in marine meteorology, forecasts and storm warnings, climatology, publication, investigation of the upper air (by W. H. Dines), and miscellaneous subjects, with appendixes as follows: Report by the liquidator of the meteorological council, supply of information to the public, lists of observers who sent in "excellent" meteorological logs during the year and of logs and documents received from ships, distribution of instruments, report on inspection of meteorological stations, list of persons and institutions from whom publications and meteorological data have been received and to whom publications are sent, and financial statement.

The report calls attention particularly to progress made in the organization of international cooperation during the year.

During the year 1907 the percentage of complete success in the forecasts for the whole of the British Isles was 54, of the sum of complete and partial successes 91, the average for 10 years 86.5.

The daily normal temperature and the daily normal precipitation of the United States. F. H. Bigelow (*U. S. Dept. Agr., Weather Bur. Bul. R, pp. 186*).—The results of the calculation to a uniform basis of the reliable available data on temperature and precipitation in the United States are given in tabular form in this bulletin. It is stated that "these tables of daily normal temperature and precipitation are now in use in the climatological work of the Bureau throughout the United States, and they have superseded all the daily normals which were prepared several years ago from much less extensive data than were available in the formation of these tables."

Monthly Weather Review (*Mo. Weather Rev., 35 (1907), No. 13, pp. XIX+607–616+19, pls. 31, charts 6*).—The report contains the usual summaries of general climatic conditions with regard to pressure, temperature, precipitation, relative humidity, climatological tables, table of contents, index, etc., of the Monthly Weather Review for 1907, and an appendix containing the annual report of the Chief of the Weather Bureau for the year ended June 30, 1907.

The most notable abnormal meteorological features of the year were the wide fluctuations in the seasonal temperature, resulting in "the extreme warmth of the latter part of March over the districts east of the Rocky Mountains, and the continued cold attending the progress of the later spring and early summer months over the greater part of the same districts. . . .

"Temperature was below the normal during the greater part of the year over all northern districts of the United States and also over the whole of Canada, except portions of British Columbia. The total deficiency, however, was generally less than 2°. Over the southern portions of the United States there was a corresponding excess, which prevailed by small amounts during most of the months of the year. . . .

"In general the precipitation for the year was above the normal in the central portions of the Middle Atlantic States, portions of the Lake region, the Ohio and middle Mississippi valleys, the central Gulf States, and in the Rocky Mountain and Plateau districts, and portions of western Oregon and northern California.

"Over the South Atlantic coast, the southern Appalachian region, Florida Peninsula, the west Gulf States, the Great Plains from Texas to the northern boundary, portions of the Lake region, and along the north Pacific coast there was a general and well-marked deficiency in the annual precipitation.

"Along the immediate Atlantic coast from Chesapeake Bay to Florida, and over eastern Texas and the western portions of Louisiana and Arkansas, the deficiency ranged from about 5 to more than 20 in.

"The general distribution of precipitation during the various seasons of the year was such that except over small areas there was no important interest that suffered materially from either excess or deficiency of moisture."

Meteorological statistics for 1907. F. H. Loud (*Colo. Col. Pub., 12 (1908), Sci. Ser., No. 5, pp. 101–136*).—The equipment and methods of observation at the observatory of Colorado College are described and a record is given of observations on temperature, pressure, humidity, rainfall, etc., during the year.

Climate [of Maryland]. W. B. Clark and E. B. Mathews (*Md. Geol. Survey [Rpt.], 6 (1906), pp. 22½–237, figs. 7*).—This is a general description of the more important climatic factors of the State.

The meteorological service and the climate of São Paulo. J. N. Belfort Mattos (*Sec. Agr. Com. e Obras Pub. Estado São Paulo, Secc. Met. [Pub.], Ser. 2, No. 3, pp. 17, maps 3*).—A brief historical note regarding the meteorological service is given and the general climatic features of the State of São Paulo are described, with tables showing averages of results of observations on temperature, pressure, humidity, rainfall, cloudiness, and direction of wind for the warmest month (January), coolest month (July), for the different seasons, and for the year as a whole.

The weather of 1907 at the Midland Agricultural and Dairy College, Kingston-on-Soar, Notts (*Midland Agr. and Dairy Col. Bul. 10, 1907–8, pp. 111–114, dgm. 1*).—The results of the usual meteorological observations are summarized in notes and a table and diagram.

Dew measurements during 1904 to 1907. N. Passerini (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 5 (1908), No. 3, pp. 37½–387*).—Determinations of the amount of water collected on a surface 1 decimeter square, the velocity of the wind, and the state of the sky during the period named are reported. The total amounts of water so collected were as follows: 1904, 81.7 gm.; 1905, 88.6 gm.; 1906, 76.1 gm.; and 1907, 72 gm. The annual periods of maximum and minimum deposition varied widely during the different years.

Report on the work of the station of agricultural climatology of Juvisy during 1907. C. Flammarion (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), Nos. 8, pp. 966–979, figs. 6; 9, pp. 1101–1113, figs. 3*).—As usual, this report contains records of observations on atmospheric pressure, the temperature of the air, soil, and underground water, and the relative humidity, rainfall, sunshine, cloudiness, radiation, wind, influence of different colored lights and of the moon

on growth of plants, and the falling and renewing of leaves. The data are recorded in tables and diagrams.

Study of the climate of Rennes, C. Cloarec (*Trav. Sci. Univ. Rennes, 5 (1906), pp. 103–112; 6 (1907), pp. 17–31, fig. 1*).—This is more particularly a study of daily variations of temperature based upon observations during 25 years, 1879–1903. These studies indicate a certain periodicity in the variation of temperature throughout the month, namely, an elevation from the second to the ninth, a fall from the ninth to the twenty-first, an elevation from the twenty-first to the twenty-eighth, and a fall from the twenty-eighth to the second of the month following.

Meteorological observations at the Ploti Experiment Station, 1907, M. Boulatovitch and A. Winkler (*Ghodichnuĭ Otchet Ploty. Selsk. Khoz. Opuitn. Stantziĭ, 13 (1907), pp. 1–53, 161–167*).—The total rainfall in 1907 was 11.37 in., the mean for 13 years being 16.26 in. This low rainfall is exceptional, but one other year, 1904, approaching it with a total rainfall of 11.6 in. Precipitations so small as to be of little value were very numerous during the year, there being 116 rainy days. The deficiency of rainfall was especially noticeable in May and October, as these are usually the months of greatest precipitation.

The total evaporation for the year was 28.3 in., the mean for 13 years being 32.5. The mean relative humidity was 70 per cent, being 3 per cent below the 13 year average.

The average temperature for the year was 7.8° C., or 1.1° lower than the 13 year average; the maximum, 34.7°, was on August 21, and the minimum, —24°, January 21 and 24. The maximum temperature of the surface soil was 59.6° C., the minimum —26.7°.

The average atmospheric pressure was 29.54 in., or 0.02 in. above the normal. The number of hours of sunshine was 1,971.2, or 79.5 hours below the normal.

Report of the meteorological commission [Cape of Good Hope], 1907, C. A. Smith et al. (*Rpt. Met. Com. [Cape Good Hope], 1907, pp. XIV+73*).—This report contains a brief account of the general work of the commission during 1907, a table showing distribution of instruments during 1907, a financial statement, and results of observations during the year on evaporation, temperature, pressure, sunshine, radiation, and rainfall at various stations throughout Cape of Good Hope, as well as observations on surface temperature of the sea.

A comparison of the rainfall of Sydney and Melbourne, 1876–1905, A. Duckworth (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 190–195, pls. 2*).—Comparisons of total rainfall, variation, and distribution are made in notes, tables, and diagrams.

Problems of the artesian water supply of Australia, with special reference to Professor Gregory's theory, E. F. Pittman (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 100–139, pls. 2*).—This article deals at some length with the objections urged by Gregory against the hydrostatic pressure theory, and then considers the theory which he propounds in lieu of it, viz, that the artesian water supply of the Australian basin "has been evolved from underground masses of igneous rocks, and is forced above the surface in bores by the influence of temperature and rock pressure." The author does not accept this theory as compatible with the actual conditions prevailing.

Chlorin and solid matter in river water, J. Sack (*Inspectie Landb. West-Indië Bul. 13, pp. 24–29*).—Determinations of chlorin and solid matter in samples of water of a number of Javan streams at different seasons of the year are reported.

The decomposition and nitrification of sewage (1) in alkaline solutions, (2) in distilled water, J. E. Purvis and R. M. Courtauld (*Proc. Cambridge Phil. Soc., 14 (1907), No. 4, pp. 354–360*).—Studies of the decomposition and

transformation of nitrogen compounds in solutions of sodium chlorid, magnesium sulphate, and magnesium chlorid, of strengths equivalent to that of the corresponding salts found in the water of the British Channel, when 1 per cent sewage was added to them, either singly or combined, show that the salts seriously interfere with the decomposition of the sewage. "There was only a slow production of the two ammonias, although there was a progressive decline in the amount; and the nitrates were so small in amount that they must have been less than 0.005 part per 100,000. And the present experiments prove that when sewage was incubated in slightly alkaline solutions there were definite amounts of nitrates produced, whilst there was a greater production when the incubations were in distilled water alone. . . . There can be little doubt, therefore, that the salts in sea water do interfere with the development of useful nitrifying organisms whose normal action under proper conditions is to convert sewage into substances like nitrates."

Royal Commission on Sewage Disposal, H. C. H. Shenton (*Surveyor, 34 (1908), Nos. 871, p. 342; 872, pp. 352–354; 873, pp. 376–378; 874, pp. 401–404; 875, pp. 430–432; abs. in Science, n. ser., 28 (1908), No. 717, pp. 405, 406; Chem. Abs., 2 (1908), No. 23, pp. 3251–3253*).—This report contains the results of a large number of hearings by the commission as to the relative merits of various methods in use in England for purifying town sewage. Among the general conclusions reached by the commission are the following:

"We are satisfied that it is practicable to purify the sewage of towns to any degree required, either by land treatment or by artificial filters, and that there is no essential difference between the two processes, for in each case the purification, so far as it is not mechanical, is chiefly effected by means of microorganisms. The two main questions, therefore, to be considered in the case of a town proposing to adopt a system of sewage purifications are: First, what degree of purification is required in the circumstances of that town and of the river or stream into which its liquid refuse is to be discharged? Second, how the degree of purification required can, in the particular case, be most economically obtained. . . . We may state that we know of no case where the admixture of trade refuse with the sewage makes it impracticable to purify the sewage either upon land or by means of artificial processes, although in certain extreme cases special processes of preliminary treatment may be necessary."

The commission is also of the opinion that while "no land is entirely useless . . . peat and stiff clay lands are generally unsuitable for the purification of sewage."

Royal Commission on Sewage Disposal (*Surveyor, 34 (1908), No. 869, pp. 284–286; Brit. Med. Jour., 1908, No. 2497, p. 1447*).—The summary of conclusions and recommendations of the report of the commission referred to above is quoted and commented upon.

SOILS—FERTILIZERS.

Bibliography of the geology of Connecticut, H. E. Gregory (*Conn. State Geol. and Nat. Hist. Survey Bul. 8, pp. 123*).—This bibliography contains a number of references to articles relating to the soils of the State.

The distribution and location of moors in Germany, P. Krische (*Illus. Landw. Ztg., 28 (1908), No. 48, pp. 419–421*).—Data on this subject are summarized and briefly discussed. See also a previous note (E. S. R., 20, p. 16).

Agrologic study of an estate by the synthetic method of J. Hazard, A. Grégoire and F. Halet (*Bul. Inst. Chim. et Bact. Gembloux, (1908), No. 75, pp. 1–43, pls. 2, figs. 2, charts 4*).—This article reviews briefly the history of the

development of agronomic charts and discusses their practical value, and reports detailed studies of the topography, geology, hydrology, and composition and structure of soils of a large Belgian estate. The practical application of the results of this study in the culture and management of the estate are also discussed. A strong plea is made for the more extended preparation and use of such surveys.

Agronomic charts, E. Leplae (*Rev. Gén. Agron., n. ser., 3 (1908), No. 6–7, pp. 252–261*).—This is a discussion of the agricultural value of such charts in reply to the article by Grégoire and Halet noted above.

The agronomic chart of Belgium and analyses of soils, E. Leplae (*Rev. Gén. Agron., n. ser., 3 (1908), No. 5, pp. 193–217*).—The author calls attention particularly to the great diversity of methods which have been proposed and are used for the charting of soils and for their physical and chemical examination, and urges the importance of systematic inquiry with reference to the adoption of uniform methods.

Agronomic charts, A. Grégoire and F. Halet (*Ann. Gembloux, 18 (1908), No. 7, pp. 395–402*).—The authors take exception to the conclusion of Leplae that it is not feasible to prepare agricultural charts of Belgium which are of special practical value.

Agronomic charts, A. Proost (*Rev. Gén. Agron., n. ser., 3 (1908), No. 9, pp. 346–349*).—This is a reply to Leplae's criticisms noted above.

The study of soils (*Rev. Gén. Agron., n. ser., 3 (1908), No. 9, pp. 349–351*).—A further discussion of the utility of agronomic charts or soil maps.

Agrological studies, L. A. Rebello da Silva (*Rev. Agron. [Portugal], 5 (1907), Nos. 11, pp. 333–337; 12, pp. 365–371; 6 (1908), No. 1, pp. 5–9*).—A classification including 5 groups is described, with mechanical analyses by Schöne's method of 13 samples of Portuguese soils.

The use of geo-agrological maps in the assessment of taxes in the valleys and plains of the Province of Verona, E. Nicolis (*Atti. e Mem. Accad. Agr. [etc.] Verona, 4. ser., 7 (1907), pp. 123–213, map. 1*).—Such a map is given and its preparation and use explained.

Analyses of soils from Papua, F. B. Guthrie and R. S. Symmonds (*Agr. Gaz. N. S. Wales, 19 (1908), No. 4, pp. 326, 327*).—Physical and chemical analyses of 12 samples of soils from this region are reported. These show that the soils are as a rule very fertile loam. Only one sample was found to be acid. In all other cases the soils were abundantly supplied with lime. The soils were as a rule well supplied with nitrogen and phosphates, but were invariably low in potash.

Soil analysis as applied to forestry, Vater (*Tharand. Forstl. Jahrb., 58 (1908), No. 1, pp. 1–20*).—This is a general discussion of the importance of soil analysis as applied to forestry.

A study relative to the causes of the dying out of artificial forest plantings in the steppes, S. Kravkov (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 1, pp. 96–118*).—As a result of a preliminary investigation made in 1906 and 1907 in the experimental forest of Veliko-Anadol, the author concludes that the generally accepted hypothesis that the high salt content of the steppe soil is the chief cause of the failure of artificial forest plantings is not confirmed. He is led to believe that the trees may die at a certain age through lack of sufficient assimilable phosphoric acid and nitrogen, and in some cases of potash. These constituents are sometimes completely absent in assimilable form in the deep soil layers as the result of depletion by forests already established.

This dying out is observed only in those places in the steppe forest region where, owing to the peculiar surface formation, definite physical properties of

the soil and subsoil, or peculiar meteorological conditions, the subsoil does not become moistened down to the water level. A part of the plant food taken up by the trees is returned to the surface of the soil by the decayed leaves. In the absence of sufficient moisture to thoroughly wet the subsoil, however, the leaf ash constituents are not washed very deep; hence an annually increasing exhaustion of certain soil layers leading to the death of new forest plantings when the roots reach these layers.

Theoretical considerations regarding factors influencing certain of the so-called physical properties of soil, P. Ehrenberg (*Mitt. Landw. Inst. Breslau, 4 (1908), No. 3, pp. 445–493; abs. in Chem. Zentbl., 1908, I, No. 26, p. 2197; Chem. Ztg., 32 (1908), No. 73, Repert., p. 463*).—This article discusses at considerable length the theory of colloids, nature of colloids in cultivated soils, and importance of colloids in relation to the physical, chemical, and biological properties and processes of soils.

On physical properties of soils, H. Rodewald (*Fühling's Landw. Ztg., 57 (1908), No. 13, pp. 455–458*).—A review of the above article.

Note on a flowing (melting) soil, A. Grégoire (*Bul. Inst. Chim. et Bact. Gembloux, 1908, No. 75, pp. 86–98*).—A study of the structure and physical properties of a fine-grained soil which easily breaks down and forms a liquid mass when wet is reported.

The lines of flow of water in saturated soils, L. F. Richardson (*Sci. Proc. Roy. Dublin Soc., n. ser., 11 (1908), No. 27, pp. 295–316, figs. 7*).—This article explains "a simple method for determining the relation between the distance apart of ditches and the height to which the saturating water will rise with a given rainfall, special reference being made to the draining of peat-mosses." The formulas and diagrams deduced for the purpose are based upon Boussinesq's differential equations for the percolation of water in a nonexpanding, porous soil, which in turn are founded on the supposition that the general velocity of the water is proportional to the pressure gradient.

The relation of soils to water with special reference to the formation of ground water, C. Mezger (*Gesndtsing., 31 (1908), No. 16, pp. 241–251, figs. 4*).—This is a discussion of the balance of evaporation, precipitation, and drainage, and the relation of soils to hygroscopic moisture, as brought out by the work of various investigators.

Soil wastage, T. C. Chamberlin (*Pop. Sci. Mo., 73 (1908), No. 1, pp. 5–12*).—The causes, extent, and practical means of prevention of soil exhaustion by erosion and leaching are discussed in this article, and it is shown that the solution of the problem lies in due control of the water which falls on the surface and that "all the rainfall during the growing season, and much or all of that which can be carried over from the nongrowing seasons" can be used with profit by the adoption of suitable methods of tillage and cropping.

Soil temperature investigations, A. Hecker (*Fühling's Landw. Ztg., 57 (1908), No. 13, pp. 458–471*).—Extensive series of observations are reported which lead to the conclusion that certain fertilizers, particularly well-rotted manure, lime, kainit, etc., exert a marked influence on the temperature conditions of the surface soil. This action is considered to be indirect and due to the influence of these substances on the physical properties and processes of the soil.

Manure, lime, and magnesia make the soil porous and thus reduce conductive power for heat. Kainit and nitrate of soda in large amounts make the soil more compact and thus increase conductive power. Under the first condition variations in temperature are greater than under the second, i. e., there are higher temperatures during the day and lower during the night.

Observations and researches in soil temperature, S. de Grazia (*Staz. Sper. Agr. Ital., 41 (1908), No. 2–4, pp. 97–114; abs. in Chem. Zentbl., 1908, I, No. 26, p. 2197*).—This is a study of the effect of stable and green manures on soil temperature.

The experiment was made in pots kept under shade to avoid solar radiation and care was taken to prevent the earth in the pots from being wet by rains. In one pot the earth was compressed so as to resemble sod; in the others the earth was left loose as in well worked soil. With one of these well pulverized cow manure was incorporated and into the others green manures as follows: Beans, vetch, lupines, rye, and barley. The manure was used at the rate of about 22 tons per acre, and was so compressed as to fill the space from 10 to 25 cm. below the top of each pot. A thermometer was placed at each of these depths.

In the loose soil the temperature was slightly higher than in sod at both depths. The stable manure caused an increase of temperature at both depths, but the green manure was always more effective. Of the green manures, the legumes gave better results than the grasses, and of the legumes vetch was most effective and beans least so.

Fixation of atmospheric nitrogen by leguminous plants, M. Passon (*Bol. Inst. Agron. [São Paulo], 1 (1908), No. 2, pp. 56–63*).—The yield of dry matter and nitrogen content of fertilized (with potash and phosphoric acid) and unfertilized velvet beans, cowpeas, and *Arachis prostrata* are reported. The use of the mineral fertilizers increased both yield and nitrogen content and is considered a profitable practice in the growing of leguminous plants for green manuring.

Experiments on cross-inoculation of different genera of leguminous plants with pure cultures of tubercle bacteria, F. Nobbe, L. Richter, and J. Simon (*Landw. Vers. Stat., 68 (1908), No. 3–4, pp. 229–252; abs. in Deut. Landw. Presse, 35 (1908), No. 52, pp. 556, 557*).—The results of cross-inoculation with *Pisum sativum, P. arvense, Vicia sativa, V. villosa, Medicago lupulina, M. sativa, Trifolium pratense, T. repens, T. incarnatum, Laburnum vulgare, Lotus corniculatus, Robinia pseudacacia, Ornithopus sativus, Onobrychis sativa,* and *Lupinus luteus* are reported, showing that pure cultures from tubercles of one member of a genus are effective on other members of the same, and, as a rule, only of the same, genus. There was, however, in these experiments complete interchangeability in case of peas and vetches and partial in case of lupines and serradella.

Nitrogen in dead forest cover, E. Henry (*Rev. Eaux et Forêts, 47 (1908), No. 9, pp. 274–278; Bul. Soc. Sci. Nancy, 3. ser., 9 (1908), No. 4, pp. 353–357*).—This is a review of investigations relating to this subject which confirm the author's conclusion that under favorable conditions there is always a decided increase of nitrogen by the fixation of the free nitrogen of the air in dead forest cover.

The influence of bacteria on evaporation from soils, R. Stigell (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 1–3, pp. 60, 61*).—Observations on the rate of evaporation of water from Petri dish cultures of *Bacillus subtilis, B. coli communis, B. mesentericus fuscus,* and *Proteus vulgaris* in quartz sand, water, and bouillon show that evaporation was in all cases greater and more rapid in sterile cultures than in those inoculated with the organisms. This is attributed to utilization of moisture by the organisms, absorption in their metabolic products, and reduction of the porosity of the medium by the metabolic products of the organisms.

Concerning the difference of behavior of soil organisms when in solution and when in soils, F. L. Stevens, W. A. Withers, et al. (*Abs. in Jour. Elisha Mitchell Sci. Soc., 24 (1908), No. 2, p. 51; Science, n. ser., 27 (1908), No. 704,*

p. 994).—This is a summary of a preliminary report giving the results of numerous experiments which show "that the activities of ammonifying, nitrifying, denitrifying, and nitrogen-gathering bacteria are different in soils from what they are in solutions and that no adequate knowledge of the efficiency of these various soil organisms in effecting chemical change can be attained by tests conducted in solutions. Even the relative powers of different organisms or of different soils is largely affected by the conditions of the test. It seems therefore that in the study of soil bacteria the work must be done with soils, rather than with solutions, or at least that frequent controls or checks in soil must be made."

Nitrification in acid soils. A. D. Hall, N. H. J. Miller, and C. T. Gimingham (*Proc. Roy. Soc. [London], Ser. B, 80 (1908), No. B 539, pp. 196–212; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 11, p. 581; Jour. Chem. Soc. [London], 94 (1908), No. 548, II, p. 524*).—The more important features of this article are summarized as follows: "In the soil of certain of the permanent grass plats at Rothamsted, which is distinctly acid in consequence of the long-continued use of ammonium chlorid and sulphate as manure, nitrification is greatly reduced, and the nitrifying bacteria are only found sparingly. In bulk, nitrification still goes on slowly, despite the acidity of the soil. Water extracts of the soil will not permit of nitrification unless they are previously neutralized. The amount of nitrate produced would not be sufficient for the nitrogen taken up by the crop, which must, in the main, utilize the ammonium salts without previous change. The acidity is chiefly due to sparingly soluble 'humic' acids; free hydrochloric and sulphuric acids are also present, because the soil extract contains soluble acid in quantities comparable to the amount of chlorids and sulphates also present, and to the ammonium sulphate and chlorid annually supplied as manure.

"The acidity is not brought about by purely chemical or physical actions of the soil upon the ammonium salts, but by various microfungi which are able to remove ammonia from a solution of its salts and set free the acids with which it was combined, the acidity attained in this way being equivalent to that of the soil water on the acid plats.

"The authors attribute the continuance of the nitrification in these soils to the irregular distribution of the materials composing them; though acid as a whole, they still contain some calcium carbonate, each of the particles of which forms a center for the nitrification process. The decline in fertility of the acid plats may be attributed to the repression of the normal bacterial activities of the soil and the encouragement of the growth of molds."

Nitrogen-fixing bacteria. III. F. Löhnis and N. K. Pillai (*Centbl. Bakt. [etc.], 2. Abt., 20 (1908), No. 24–25, pp. 781–799; abs. in Chem. Ztg., 32 (1908), No. 50, Repert., p. 323; Jour. Chem. Soc. [London], 94 (1908), No. 548, II, pp. 522, 523*).—Repeating and verifying work of other investigators, the authors studied (1) the most suitable culture solutions for nitrogen-fixing organisms, (2) the effect of manuring on fixation, and (3) variations in fixing power from month to month throughout the year.

The experiments were as a rule made by inoculating 100 cc. of the culture solution with 10 gm. of soil.

Mannite and xylose were found to be the most efficient sources of carbohydrates in nutrient solutions, humus the least efficient. Manuring did not greatly increase the rate of fixation, but superphosphate was very effective in this respect. The crop yields varied quite uniformly with the rate of fixation. The fixing power of soils from plats varied from month to month during the year, there being 2 maxima, one in the spring and another in the autumn. See also previous work (E. S. R., 19, p. 624).

On dicyandiamid bacteria, R. Perotti (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 7–8, pp. 200–231*).—The literature of investigations on this subject is reviewed, and an account is given of the author's investigations on the activity of bacteria in culture media containing dicyandiamid, isolation and determination of species growing in such media, the changes which the species bring about in the media, comparison of dicyandiamid with other sources of nitrogen food for the organisms, and growth of field crops on media containing dicyandiamid.

In media containing grape sugar and dicyandiamid (not exceeding 1 to 2 parts per 1,000) as the only source of nitrogen, there was a vigorous and characteristic growth of micro-organisms, including various bacteria and fungi, some new, others common forms. Certain of the forms apparently found the conditions in dicyandiamid media more favorable than others, but there was great variation in the morphology and cultural relations of the organisms which utilized dicyandiamid as a source of nitrogen to best advantage. Some of these organisms utilized other sources of nitrogen, particularly amids, as well as dicyandiamid. The activity of the organisms resulted in a slight decrease in the percentage of dicyandiamid without a corresponding increase of ammonia. Contrary to the statement of Ulpiani, the dicyandiamid did not undergo fermentative action.

The general conclusion drawn from this work is that dicyandiamid is a very good nitrogen food for many micro-organisms. Higher plants grow about as well in sterile media containing dicyandiamid as in those inoculated with dicyandiamid bacteria.

The article concludes with a bibliography of 35 references to the literature of the subject.

A review of the bacteriology of ammonium compounds, P. Ehrenberg (*Fühling's Landw. Ztg., 57 (1908), No. 13, pp. 449–455*).—The relation of micro-organisms to the transformation and fixation of ammonia in soils is briefly discussed. It is stated that experiments made by the author suggest that the greater effectiveness of ammonium salts in experiments in zinc pots than in experiments in the field may be due to the action of the zinc in interfering with the activity of organisms which fix ammonia in the soil and thus decrease its efficiency, the beneficial action of the zinc in this respect overbalancing its direct injurious effect on the growth of the crop.

The fixation of ammoniacal nitrogen by zeolites in soils, T. Pfeiffer, A. Hepner, and L. Frank (*Mitt. Landw. Inst. Breslau, 4 (1908), No. 3, pp. 321–330; abs. in Chem. Ztg., 32 (1908), No. 54, Repert., p. 353; Centbl. Agr. Chem., 37 (1908), No. 11, pp. 722–724; Ztschr. Angew. Chem., 22 (1909), No. 5, p. 207*).—This is a second report on this subject (E. S. R., 17, p. 536). A study of the loss of nitrogen from soils fertilized with blood meal and ammonium sulphate, with the addition in one series of pots of calcium carbonate and in another of calcium zeolite, showed that where the zeolite was used there was a considerable reduction in the loss of nitrogen from the soil, but that in the case of oats the nitrogen so fixed was not utilized until the second crop, indicating that the ammonia was too firmly fixed by the zeolite to be available in the course of the first season.

The action of ammoniacal nitrogen under the influence of applications of lime, T. Pfeiffer, A. Hepner, and L. Frank (*Mitt. Landw. Inst. Breslau, 4 (1908), No. 3, pp. 331–339; abs. in Chem. Ztg., 32 (1908), No. 54, Repert., p. 353*).—In pot experiments it was found that on peat soils an application of lime promoted the action of ammonium sulphate. On pure sandy soils the application of very large amounts of lime exerted an injurious effect upon

the action of the ammonium salt. On loam soils the use of as much as 1 per cent of lime in the form of carbonate showed no injurious effect, but was beneficial, especially for the second crop.

The causes of the difference in effect of ammonium sulphate and nitrate of soda. F. Löhnis and E. Blobel (*Fühling's Landw. Ztg., 57 (1908), No. 11, pp. 385–402*).—The conclusion reached by the authors from experiments on different kinds of soil is that contrary to Wagner's view there is practically no loss of nitrogen in the process of nitrification in the soil. Evaporation of ammonia assumes importance only in certain cases, and as a rule furnishes no explanation for the lower efficiency of sulphate of ammonia. Interference with the progress of nitrification frequently exerts an injurious influence on the fertilizing value of ammonium salts. The absorption and fixation of ammonia, as well as the activity of ammonia-assimilating organisms, must be taken into account. Sometimes these exert a favorable influence but are often injurious. The associated constituents are in part beneficial and in part injurious to the growth of the crop.

The causes of the difference in effect of ammonium sulphate and nitrate of soda. F. Löhnis and E. Blobel, trans. by A. Koning (*Ann. Gembloux, 18 (1908), No. 12, pp. 672–699*).—A French translation of the article noted above.

The utilization of nitrogen in the form of ammonium nitrate. T. Pfeiffer, A. Hepner, and L. Frank (*Mitt. Landw. Inst. Breslau, 4 (1908), No. 3, pp. 341–349; abs. in Chem. Ztg., 32 (1908), No. 54, Repert., p. 353; Zentbl. Agr. Chem., 37 (1908), No. 10, pp. 663, 664; Jour. Chem. Soc. [London], 94 (1908), No. 553, II, p. 980*).—A series of pot experiments with ammonium nitrate is reported, the results of which indicate that this material stands as a fertilizer between nitrate of soda and sulphate of ammonia. It exhibts to a certain extent the undesirable properties of ammonium compounds, but under certain conditions it may be as effective as nitrate of soda. In combination with insoluble phosphates its action exhibits both the physiologically acid and the physiologically alkaline properties described by Prianishnikov.

The addition of phosphates increased both the yield of crop and the amount of nitrogen assimilated. Contrary to Wagner's observation, the authors found that the addition of sodium chlorid produced no effect upon the action of the ammonium nitrate.

Tests of the new fertilizing materials lime nitrogen, nitrogen lime, and lime niter. B. Sjollema and J. C. de Ruijter de Wildt (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1907, No. 2 pp. 5–50, pl. 1; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 549, II, pp. 623, 624; Zentbl. Agr. Chem., 38 (1909), No. 1, pp. 6–8*).—Studies of the effect on germination of calcium cyanamid and of the various products resulting from its decomposition in water are reported, as well as pot experiments to test the relative value of lime nitrogen and basic lime nitrate as compared with nitrate of soda.

In the germination experiments with mustard grown in sand it was found that the free lime and gases evolved by the action of water on calcium cyanamid had no injurious effect. The injury observed was attributable to the cyanamid and basic cyanamid formed. No injurious effect resulted from the presence of dicyandiamid. The injurious effects were most marked in sterile sandy soil, less marked in case of heavy moor soils and humus sand, and not observable in case of sandy moor soils.

The experiments show that lime nitrogen may exert an injurious effect in two ways: (1) By interfering with germination, as explained above, and (2) by inducing unhealthy conditions and finally death at a later period in the growth of the plants. As explained, the first of these injurious effects is at-

tributable to cyanamid, the second to dicyandiamid, as shown by pot experiments with mustard and buckwheat.

The high fertilizing effect obtained with lime nitrogen with rye and oats indicate, however, that as a rule the injurious effects of the cyanamid are not marked in practice.

Taking the effectiveness of nitrate of soda in these experiments as 100, that of sulphate of ammonia was 90 and of lime nitrogen 120. No injurious effect was observed in case of oats when the lime nitrogen was applied only one day before seeding.

Fertilizer experiments with nitrogen lime for potatoes, A. STUTZER (*Jour. Landw., 56 (1908), No. 2, pp. 141–144; Deut. Landw. Presse, 35 (1908), No. 58, p. 620; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 726*).—Comparative tests of nitrogen lime, nitrate of soda, and sulphate of ammonia in field experiments during 1907 are reported. The best results were obtained with the nitrogen lime, the poorest with ammonium sulphate. This is attributed to the fact that the season of 1907 was very wet.

Fertilizer experiments with lime niter on tobacco and tomatoes in 1907, A. STUTZER (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 5, pp. 531–538*).—Pot experiments with varying amounts of lime niter in comparison with nitrate of soda are reported. While the results obtained were not entirely conclusive they indicated that the lime niter, especially when applied in the larger amounts, was as effective as the nitrate of soda. The burning quality of the tobacco was not injuriously affected by the use of the lime niter.

Experiments in manuring wheat with calcium nitrate, G. PARIS (*Staz. Sper. Agr. Ital., 41 (1908), No. 2–4, pp. 171–191; abs. in Chem. Zentbl., 1908, I, No. 26, p. 2200*).—The author gives the results of experiments as reported by numerous Norwegian, Swedish, Danish, and German investigators, and from them concludes that calcium nitrate and nitrate of soda are equivalent in fertilizing action and that calcium nitrate, on account of its lime content, is to be preferred to nitrate of soda, especially in soils deficient in lime.

The author's experiment was made on volcanic soil deficient in lime and magnesia and was a comparison of calcium nitrate, nitrate of soda, and nitrate of soda and slaked lime. The results confirm those of the investigators mentioned above. The author further concludes that calcium nitrate as compared with nitrate of soda has a much greater resistance to denitrifying microorganisms. This conclusion has also been reached by other investigators.

On the utilization of the atmospheric nitrogen in the production of calcium cyanamid, and its use in agriculture and chemistry, A. FRANK (*Chem. News, 97 (1908), Nos. 2534, pp. 289–292, fig. 1; 2535, pp. 303–306, figs. 2; abs. in Amer. Jour. Sci., 4. ser., 26 (1908), No. 155, p. 509*).—This paper explains the need of finding new means of utilizing atmospheric nitrogen, describes the development of the Frank-Caro process of preparing calcium cyanamid, names the industrial plants applying the process, and discusses the use of the product.

It is asserted "what makes cyanamid especially valuable as a manure is its after effects. It is generally decomposed by the chemical and bacteriological constituents of the soil into ammonia, which becomes fixed by the vegetable mold, and is not, as with Chili saltpeter, liable to be washed into the drains and so practically lost. For this reason cyanamid which has not been used during the first harvest is always available for the second."

Phosphate deposits of Algeria and Tunis (*Bul. Imp. Inst., 6 (1908), No. 1, pp. 81–83*).—This is a brief account of these deposits prepared in view of "the rapidly increasing production of rock phosphates in Algeria and Tunis, and the apparently inexhaustible nature of the deposits in these countries."

Phosphate production in Algeria and Tunis, 1907 (*Chem. Indus. [Berlin], 31 (1908), No. 10, pp. 276, 277*).—Statistics of production and export are given for 1906 and 1907. The total exports in 1907 amounted to 1,300,000 tons. It is estimated that the exports for 1908 will amount to 1,720,000 tons.

The composition and value of sugar beet vinasse, F. Verbièse and E. Darras-Verbièse (*Betterave, 18 (1908), Nos. 450, pp. 144–146; 451, pp. 163, 164*).—Analyses of a number of samples of this material are given. The data relating to the fertilizing value of the substance show that nitrogen varies from 0.591 to 1.243 kg. per cubic meter of material, phosphoric acid from 0.211 to 0.525 kg., and potash from 0.905 to 1.724 kg. These figures indicate that the material has considerable value as a fertilizer.

Commercial fertilizers, J. S. Burd (*California Sta. Bul. 201, pp. 273–293*).—This bulletin contains tabulated analyses and valuations of 230 samples of fertilizers and fertilizing materials collected and examined during the half year ended June 30, 1908. The California fertilizer law allows a deficiency of 0.25 per cent in nitrogen, 0.5 per cent in potash, and 1 per cent in available phosphoric acid. Fifty-four of the samples reported in this bulletin showed greater deficiencies than these in one or more constituents.

Analyses of commercial fertilizers and Paris green, J. E. Halligan et al. (*Louisiana Stas. Bul. 113, p. 3–154*).—This bulletin summarizes the results of analyses of 5,267 samples of fertilizers and 40 samples of Paris green inspected under the State laws during the season of 1907–8, and discusses briefly the quality and valuation of the various materials examined. It is stated that on the whole the fertilizers were up to the manufacturers' claims and of good quality. The comparatively few failures to comply with the guaranty are attributed to poor mechanical mixture. All of the samples of Paris green examined showed more than the 50 per cent of arsenious oxid required by law, the average percentage found by analysis being 55.85 per cent.

Analyses and valuations of commercial fertilizers, C. S. Cathcart et al. (*New Jersey Stas. Bul. 215, pp. 3–39*).—This bulletin reports the results of analyses and valuations of 464 samples of fertilizing materials collected during the season of 1907–8.

Report of analyses of samples of fertilizers collected by the commissioner of agriculture during 1908 (*New York State Sta. Bul. 304, pp. 255–331*).—This bulletin gives the results of analyses by the station of samples of fertilizers collected by the State commissioner of agriculture during 1908.

AGRICULTURAL BOTANY.

Experiments in the nutrition of plants, A. Petit (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 7, pp. 820–833*).—On account of the claims that green plants are able to utilize glucose in solution through their roots, the author investigated the subject from the standpoint of the horticulturist, hoping to counteract the effect of cloudy days and long winter nights in the forcing of vegetables, flowers, etc.

In the preliminary experiments, which were carried on in November and December, coleuses, calceolarias, and abutilons were grown in pots 15 cm. in diameter filled with earth. To one lot 4 gm. of glucose and to another lot 8 gm. of glucose were given in 2 doses at 15-day intervals. Each pot was fertilized with 0.5 gm. sulphate of ammonia and 0.2 gm. phosphate of potash. The weight of the plants was determined at the end of December, when those receiving the greater quantity of glucose were so manifestly inferior to those not receiving the glucose that the experiment was repeated with a still greater

reduction in the amount of glucose and an increase in the amount of other fertilizers. In this experiment the presence of the glucose was not only unfavorable, but in some instances was positively detrimental to the growth of the plants.

A third experiment was carried on in February and March in a similar way, in which 0.5 gm. of glucose was added to each pot at 8-day intervals, comparisons being drawn between the growth of plants in pots deprived of nitrogen and others receiving sulphate of ammonia. In this case it was thought possible to test the effect of glucose in favoring the fixation of nitrogen by the micro-organisms in the soil. The weight of the plants, determined as before, plainly indicated a reduction of growth in every case where the glucose had been added.

A final experiment was conducted in forcing strawberries, and while the author proposes to continue his experiments next winter, he does not think that there is anything to warrant the hope that any notable improvement can be secured by the use of glucose for the early forcing of plants.

In connection with the growth of beans, the author tested the value of the application of nitrate of soda to the pots, contrasting the total weight of the plants and the yield of the green pods where nitrate of soda was added with the same grown in pots containing no nitrogen. The application of the nitrate notably increased the development of the plants and pods and also the earliness of their yield. The best results were obtained where the nitrate of soda was applied a few days after the beans had germinated and begun growth.

Investigations on the localization of saccharose in sugar beets. J. Peklo (*Sitzber. K. Böhm. Gesell. Wiss. Math. Naturw. Cl., 22 (1907), pp. 1–28, pl. 1; abs. in Bot. Centbl., 108 (1908) No. 9, pp. 239, 240*).—By means of Senft's method, which consists of the use of phenylhydrazin, sodium acetate, and glycerin, the author made some micro-chemical investigations to determine the localization of saccharose in sugar beets, and found that for the most part it is localized in the neighborhood of the sieve tissues.

Observations on the osmotic properties of the root hairs of certain salt-marsh plants. T. G. Hill (*New Phytol., 7 (1908), No. 6–7, pp. 133–142, figs. 5*).—A study was made of various salt-marsh plants to determine the effect of differences in the salinity of the soil upon the plants and how the plant accommodates itself to the fluctuating concentration of the soil water.

The results of the investigations clearly showed that the root hairs of Salicornia, growing in places where the soil water is strongly saline, can adapt their internal osmotic pressure to the osmotic strength of the soil water. It was found that the osmotic pressure in different root hairs of the same individual plant varies, as a rule the younger hairs having a higher equivalent. The cells of the root cap have a very low coefficient. The osmotic pressure of root hairs of different individuals of the same species may also vary.

On transferring isolated seedlings from relatively strong saline solutions to fresh water, the tips of the root hairs were found to swell and assume abnormal shapes. Branching was also occasionally seen. The cellulose wall of the tip of the root hair under some conditions may become thickened, and this is believed to be possibly of value in giving the end a greater strength in order to protect against a sudden increase in the internal pressure.

The amount of sodium chlorid in seedlings seems to increase from the root upward, the salt being most abundant in the higher region of the hypocotyl and in the fleshy cotyledons.

The action of compressed gas on the activity of micro-organisms and ferments. C. Foa (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5 ser., 15 (1906), II, pp. 53–58, fig. 1; abs. in Bot. Centbl., 107 (1908), No. 24, pp.*

622, 623).—Experiments showed that a pressure of 4 atmospheres of hydrogen in the presence of normal amounts of oxygen had no injurious effect on the life of micro-organisms or on the activity of enzyms and toxins. A pressure of 4 atmospheres of oxygen or of carbon dioxid checked the development of micro-organisms. Their activity was checked in proportion to the superficial area of the colonies. Compressed oxygen checked the activity of yeasts, but not their cell-free alcoholic fermentation. Carbon dioxid under pressure checked both.

The addition of reducing substances, such as glucose and soda, increased the development of anaerobic organisms under pressures of 4 to 5 atmospheres of oxygen. *Sarcina aurantiaca* was rendered colorless by this combination of conditions. The addition of such materials to compress carbon dioxid was without effect.

The effect of dialysis on vegetable rennets, C. Gerber (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 14, pp. 601–603*).—In a previous paper (E. S. R., 20, p. 26), the author called attention to the fact that in the juices of a number of plants rennets were obtained which had the power of coagulating milk. In the present paper he gives an account of investigations on the dialysis of the juices of some plants containing rennet, in which he found that when dialyzed the juice obtained from a species of fig was 4 times less active and that from a paper mulberry 8 times less active than the original sap. It was also found that on precipitating the sap obtained from the osage orange and dissolving the precipitate in a salt solution, the dialyzed liquid was 9 times as active as the filtrate. The addition of a large amount of water to the plant juices had the same effect as dialysis.

Arsenic in vegetation exposed to smelter smoke, R. E. Swain and W. D. Harkins (*Jour. Amer. Chem. Soc., 30 (1908), No. 6, pp. 915–928*).—The basis of the work described has been the vegetation of Deer Lodge Valley and adjacent territory in Montana, particular attention being paid to hay and wild grasses, as it was claimed that live stock were suffering from poisoning due to eating grasses and hay that had grown in regions subject to smelter fumes.

Both arsenic trioxid and copper were determined, and in some samples of grass were obtained as high as 1,550 parts per million of arsenic trioxid and 1,800 parts of copper. In comparison the authors grew cereals in soil samples that were taken outside of the range of smelter smoke. In no case did they find more than 0.0002 per cent of arsenic trioxid in the mature plants, while as high as 0.0263 per cent was obtained from grass grown on the same soil 5 miles from the smelter but in the direction of the prevailing winds. Analyses were made of a number of other plants which showed that the large amounts of arsenic trioxid were deposited upon the plants and could not have been absorbed from the soil.

The results of the investigations showed very plainly that the greatest accumulation of arsenic occurred after the period of growth was ended and the plant was dead. There was little doubt that the rains during the summer washed much of the arsenic from the vegetation, while in the winter the grass was protected by snow. That the arsenic is deposited rather than absorbed is shown by the fact that by shaking dry hay or grass grown in the vicinity of the smelter, a finely divided powder was obtained that was much higher in arsenic than the grass from which it came.

Comparisons are given of analyses of grasses and other plants taken from the vicinity of smelters in other parts of the country.

Effect of illuminating gas and ethylene upon flowering carnations, W. Crocker and L. I. Knight (*Bot. Gaz., 46 (1908), No. 4, pp. 259–276, figs. 4*).—On account of the common belief that plants do poorly in houses lighted with gas and because of various inquiries from carnation growers as to the effect of illu-

minating gas upon the flowering carnation, the authors have carried on some experiments, which are described in detail, to determine the effects and toxic limits of illuminating gas and ethylene on the buds and flowers of the carnation. In a later paper they expect to describe in detail the effects of illuminating gas and its main constituents upon the vegetation of the carnation.

The authors found the flowers of the carnation to be extremely sensitive to traces of illuminating gas in the air. With the varieties Boston Market and pink Lawson, 3 days' exposure to 1 part in 40,000 kills the young buds and prevents the opening of those already showing petals. In the same varieties 1 part gas in 80,000 causes the closing of the open flowers after 12 hours' exposure. This injury takes place directly on the bud or flower exposed and not indirectly through absorption by the roots. The so-called "sleep" of the carnation is probably often caused by traces of illuminating gas in the air.

Ethylene is even more fatal to the flowers of the carnation. Three days of exposure to 1 part in 1,000,000 prevents the opening of buds just showing the petals, and 12 hours' exposure to 1 part in 2,000,000 causes the closing of flowers already open. There is apparently evidence to indicate that the toxic limit of illuminating gas upon these flowers is determined by the ethylene it contains.

As yet no chemical test has been found that is delicate enough to detect the least trace of illuminating gas that will cause injury to carnations.

The viability of seeds, J. J. Thornber (*Plant World, 11 (1908), No. 7, pp. 158, 159*).—Observations are reported on the viability of seeds after continuous prolonged submergence. The experiments were conducted at the Arizona Experiment Station and were suggested by the conditions which obtain in the valley of the Colorado River in southwestern Arizona, which is subject to an annual rise in May and June following the melting of the snows in the mountains near its source. There is practically no rainfall in this section, and annual crops are grown by sowing seed on the flood plains before the season of high water begins.

In the experiments noted, the seeds were sown in soil in the usual manner and flooded to a depth of 12 in. for a period of 38 days, which is about the period of average submergence over the lower flood plain of the Colorado River. With this treatment the percentages of germination of normal seeds were as follows: Bermuda grass 42, Johnson grass 45, amber cane 45, wild hemp (*Sesbania macrocarpa*) 75, Japanese rice 36, Honduras rice 23, and sugar beets 16. No germination resulted with oats, rye, corn, millet, or Jerusalem corn after more than a few days' submergence. Where the period of submergence was extended to 50 days, the percentages of germination were: Bermuda grass 14, Johnson grass 23, amber cane 45, Honduras rice 23, and wild hemp 13. Of radish, rutabaga, sugar beet, and tomato seed, 100 per cent germinated after being under water for 21 days, cabbage and celery seed 75 per cent, and watermelon seed 33 per cent. In the latter instance the seed was not placed in the soil.

On the longevity of seeds, A. J. Ewart (*Proc. Roy. Soc. Victoria, n. ser., 21 (1908), No. 1, pp. 1–210, pls. 2*).—A study has been made of a large number of seeds, ranging from fresh seeds to those known to be 60 or more years old, to determine their germination. In all, more than 3,000 tests were made, embracing many species and genera. The results of the tests are given in alphabetical lists, and with these are incorporated all the previous records that the author was able to verify or correct.

In summarizing the tabulated results, the author divides seeds into 3 biological classes, according to their duration of life under optimal conditions. These are short-lived or microbiotic seeds whose duration does not exceed 3 years, mesobiotic seeds which may last 3 to 15 years, and macrobiotic seeds which may last from 15 to over 100 years.

In an appendix, Miss Jean White gives an account of experiments in which she found that hard seeds which are incapable of imbibing water owe their failure to take up water to the presence of a cuticular layer, and that when this is removed or penetrated either by mechanical means or the action of acids, the seeds swell rapidly and, if their vitality is sufficient, germinate quickly.

It is claimed that Becquerel's conclusions that the impermeability of the coats of macrobiotic seeds is a gradual result of their aging are incorrect. The impermeability is due to the presence of a cuticle developed during ripening, and its presence or absence determines whether a seed will or will not have a long life in the soil, but not whether it will have a long life when preserved in dry air. Macrobiosis is the result of a biological adaptation of the protoplasm, in which an impermeable cuticle plays a merely accessory or aiding part.

Methods and causes of evolution, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 136, pp. 35*).—A discussion is given of the methods and causes of evolution, with special reference to the application of the ascertained facts to breeding, acclimatization, etc.

The present state of knowledge of heredity in Pisum, R. H. Lock (*Ann. Roy. Bot. Gard. Peradeniya, 4 (1908), No. 3, pp. 93–111*).—A summary is given of the most important facts so far recorded with regard to heredity in Pisum, and attention is called to some of the gaps which still remain in our knowledge of the subject.

The author states that the behavior of the color characters of the testa and corolla has been worked out completely and described in terms of Mendelian segregation with the help of the idea of the masking of several characters when certain other characters are absent. The principal gaps remaining in our knowledge relate to the heredity of the purple pod and of the allelomorphs concerned in determining the number and length of internodes.

FIELD CROPS.

The revegetation of overgrazed range areas, A. W. Sampson and F. V. Coville (*U. S. Dept. Agr., Forest Serv. Circ. 158, pp. 21*).—The work here reported was conducted for the purpose of determining the relative importance of the native grasses and forage plants on the Wallowa National Forest in eastern Oregon, and to ascertain the rapidity and extent to which the important forest plants are regenerating upon overgrazed areas, what plants under the present grazing system are succeeding upon depleted range areas, and by what system of grazing the former productiveness of the range may be restored through natural reseeding.

Four zones of vegetation are recognized and described. The lower, or yellow pine zone, ranges in altitude from 3,000 to 4,500 ft. and its vegetation is made up largely of bunch grass, those occurring in the greatest abundance being blue bunch grass (*Festuca arizonica*), big bunch grass (*Agropyron spicatum*), little blue grass (*Poa sandbergii*), and mountain June grass (*Koeleria cristata*). The lodgepole pine zone occupies the altitudes ranging from 4,500 to 6,800 ft. The most characteristic tree of this region is the lodgepole pine. The open grass land areas in the zone are comparatively small. While no particular grasses are especially characteristic of this zone, smooth wild rye grass (*Elymus glaucus*), short awned brome grass (*Bromus marginatus*), western needle grass (*Stipa occidentalis*), and pine grass (*Calamagrostis suksdorfii*) are among the more common species. The third, or whitebark pine zone, is from 6,500 to 8,500 ft. above sea level and is named after its most typical tree. The most striking features of this area are the great preponderance of open grass lands and the

general broken character of the forests. Mountain bunch grass (*Festuca viridula*) is preeminent in importance among the forage plants of the entire range, and associated with it are the mountain blue grasses (*Melica spectabilis* and *M. bella*). In a variety of situations, particularly in the moist habitats, mountain timothy (*Phleum alpinum*), Alpine redtop (*Agrostis rossæ*), hair grass (*Deschampsia cæspitosa* and *D. elongata*), several species of rushes and showy flowering plants eaten by stock are found. Sickle sedge (*Carex deflexa*) is important in this zone because of its rapid succession on denuded bunch grass areas. The fourth, or timberless zone, ranges in altitude from 8,000 to 9,500 ft. Herbaceous vegetation is sparse and dwarfed. A rather striking example of this feature is the stunted condition of *Trisetum spicatum* in this region. Alpine bunch grass (*Festuca brachyphylla*), *T. spicatum*, and *C. preslii*, which furnish some forage in the zone below, occur in considerable abundance. The records show an average annual precipitation of 18.95 in. in the valley surrounding the mountains, and the average annual temperature from observations made at four stations was 45.2° F. At one of the stations the temperature extremes were 110° in summer and —17° in winter.

Observations on the mountain bunch grass area reported include notes on the production of flower stalks, maturity and germination of seeds, and the destruction of seedlings by trampling. It was found that on the areas examined the plants of highest forage value, including mountain bunch grass, are not reproducing by seeds, and that most of the seedlings were sedges and particularly sickle sedge, which composed at least nine-tenths of all the seedlings. It was determined that 32.7 per cent of the seedlings found on the areas under observation were destroyed by trampling.

The results of this work show clearly that the present regulations are ineffective in bringing about the natural regeneration of the valuable grazing plants. It is believed that a system of range control, whereby the overgrazed areas may be protected from grazing animals during the period required for the maturing and dissemination of the seeds, will be as effective in the restoration of the range as a complete rest for a period of years. Moderate fall grazing, after the forage plants have performed their full functions, is considered as in no way interfering with their regeneration but rather as proving beneficial and insuring a higher percentage of germination. If such system were undertaken at the start only the more severely overgrazed areas would be closed to stock during the period required for the grazing plats to mature seed. In 1907 the seeds of the leading forage plants were matured and dispersed by September 5, and as the regular grazing on this range continues from September 20 to 30 the utilization of the forage crop under this system would be assured.

Deep fall plowing and the seed bed, S. A. Knapp (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 403, pp. 7, fig. 1*).—This publication discusses the preparation of the seed bed, the root system of corn, deep plowing and the deepening of the soil by this means, points out the advantages resulting from a deep and thoroughly pulverized seed bed filled with humus, and enumerates the conditions of soil and subsoil unfavorable to deep plowing. The discussions have reference mainly to southern agricultural practice.

Electricity and agriculture, O. Lodge (*Mark Lane Express, 99 (1908), No. 4008, pp. 91–93, figs. 3; Nature [London], 78 (1908), No. 2023, pp. 331, 332, figs. 2; Elect. Engin., 4 (1908), pp. 113–114; abs. in Agr. Gaz. [London], 68 (1908), No. 1803, p. 40, figs. 3; Sci. Abs., Sect. B—Elect. Engin., 11 (1908), No. 129, p. 405*).—Tests on a large scale at Bitton, England, of Lemström's method of electrification of soils are reported. The installation on the 10 to 11 acres subjected to the treatment is described.

"The method is to stretch over the field to be treated a number of wires on poles, sometimes like low telegraph wires, but high enough for loaded wagons and all the usual farming operations to go on underneath the wires without let or hindrance. The wires are quite thin, and are supported by a few posts in long parallel spans, about 30 ft. apart. They are supported on the posts by elaborate high-tension insulators, and they extend over all the acreage under experiment, a control plat of similar lands under similar conditions being, of course, left without any wires.

"The system of conductors is then connected at one post with a generator supplying positive electricity at a potential of something like a hundred thousand volts, and with sufficient power to maintain a constant supply of electricity at this kind of potential.

"Leakage immediately begins, and the charge fizzes off from the wires with a sound which is sometimes audible, and with a glow which is visible in the dark. . . .

"The electrification is maintained for some hours each day, but is shut off at night; it is probably only necessary to supply it during the early morning hours in summer time, and in springtime or in cold cloudy weather for the whole day, or during the time of the plant's greatest activity. But at what stages of the growth of a plant the stimulus is most effective has still to be made out. . . .

"The power required to generate the electricity is very small, for although the potential is high the quantity is insignificant, and the energy is accordingly comparatively trivial. . . .

"The electricity can . . . be generated by the revolving glass plates of a static influence machine, usually known . . . as a Wimshurst machine; or it can be generated by transforming up to high tension, and rectifying to one direction, the current of . . . a dynamo. The first is in many respects the simplest."

Increases of 30 to 40 per cent in yield and improvement in quality of wheat due to electrification are reported. A 35 per cent increase in yield and earlier ripening were observed in case of strawberries, and a 25 per cent increase in yield and larger sugar content in case of mangolds. Improvement in growth was observed in case of raspberries and tomatoes. Electrification was applied for from 600 to 1,000 hours in case of the crops experimented with.

Duty of water, G. H. True (*Nevada Sta. Bul. 63, pp. 24, 25*).—The results of a study on the amount of water necessary to produce farm crops are given in the following table:

Results of applying various amounts of water to cereal crops.

Crops.	Number of irrigations.	Depth of water.	Yield.	
			Per acre.	Per acre-foot of water.
		Ft.	*Bu.*	*Bu.*
Wheat	10	2.14	45.5	21.2
Do	7	1.97	48.0	24.4
Do	4	1.49	55.8	37.4
Do	4	1.59	46.0	28.9
Do	0	.....	13.4	.....
Barley	8	1.34	33.8	22.4
Do	5	1.28	53.5	41.8
Do	3	.93	52.0	56.0
Do	2	.99	58.5	59.1
Do	0	.....	34.0	.....
Oats	10	2.15	68.0	31.6
Do	7	2.13	121.5	57.0
Do	4	1.32	123.5	93.5
Do	4	1.43	99.4	62.5
Do	0	.....	33.8	.....

Alfalfa cut for the first time last season and grown on land not requiring an excessive amount of water yielded 7.36 tons per acre in three cuttings, with a depth of 3 ft. of water for irrigation. An old alfalfa field on gravelly land yielded but 2 tons of hay per acre, with a depth of 8.5 ft. of water applied in irrigation.

American dry farming, W. STRAWBRIDGE (*Agr. Jour. Cape Good Hope, 32 (1908), No. 6, pp. 737–740*).—The American system of dry farming is briefly summarized as follows: "(1) Fine deep sandy loam is best for dry farming. (2) Disk or lightly plow directly the crop is off. (3) Plow deep, 7 to 9 in., during the summer or autumn. (4) Harrow same day, immediately after plowing or disking, after each fall of rain, and as late in the season as possible after the crop is up several inches. (5) Pack the soil, if loose, to make it firm and retentive. (6) Do not allow any weeds to grow. (7) Keep the top 3 in. of soil loose and dry, but not too fine, so as to be dust. (8) If soil is likely to drift, harrow when damp; should that not be successful, do not fallow. (9) Only sow the best dry-grown seed. (10) Sow thinly to get good results; thick sowing in dry country has proved unsuccessful. (11) Sow the seed of wheat 2 to 3 in. deep on top of damp, moist subsoil. (12) Do not attempt dry farming with a gravel or rubble below a shallow soil. (13) Practice rotation of crops to maintain the fertility of the soil, and in cases where land can not be fallowed."

[Agriculture in the Congo Free State], PYNAERT (*Bul. Off. État Indépend. Congo, 24 (1908), No. 1–2, Sup., pp. 1–49, pl. 1*).—This is a report covering the third quarter of 1907 on the work conducted at the agricultural experiment station of Eala. Notes are given on a botanical garden, an experimental garden, and a model farm. The different species and varieties of plants added to the botanical garden are listed and the yields from rubber, spice, perfume, dye, drug, textile, oil, forage, and fruit crops are noted.

[Experiments with field crops], B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 29 (1908), No. 2, pp. 75*).—Variety, distance, fertilizer, and cultivation experiments are reported with cotton and corn, and directions are given for the preparation of composts and the use of fertilizers for tobacco. The experiments with cotton and corn were carried on at the Edgecombe, Red Springs, Iredell, and Transylvania test farms.

The varieties of corn averaging highest yields of shelled corn at Edgecombe during 8 years were Cocke Prolific, Weekley Improved, Sanders Improved, and Holt Strawberry; at Red Springs during 2 years Native, Cocke Prolific, Holt Strawberry, and Weekley Improved; and at Iredell, Weekley Improved, Sanders Improved, Cocke Prolific, and Boone County White. The earliest varieties tested on these farms are Iowa Silver Mine, Riley Favorite, Leaming Yellow, Reid Yellow Dent, Boone County Special, and Boone County White; the medium-maturing varieties, Biggs Prolific, Craig Prolific White, Cocke Prolific, and Craig Prolific Strawberry; and the late-maturing varieties, Holt Strawberry, Marlboro Prolific, Sanders Improved, Weekley Improved, and Mosby Prolific. Notes on the varieties tested in 1907 are given, and the sorts adapted to the eastern, Piedmont, and mountain sections are enumerated. The average of 6 years' results on the Edgecombe farm indicate that planting 4 by 3 ft. is best suited to the soil, and at Iredell and Red Springs, as an average of 3 and 5 years' results, respectively, 5 by 2 ft.

As an average of 8 years' tests with cotton, Russell Big Boll and Culpepper Improved ranked as the best varieties on the Edgecombe farm; as an average of 5 years' tests, Culpepper Improved, Excelsior Prolific, King Improved, and Russell Big Boll were ranked on the Red Springs farm; and as the result of 5 years' work, King Improved, King Improved Native, and Edgeworth on the

Iredell farm. The individual tests ranged from 530 to 915 lbs. of seed cotton at Edgecombe, 204 to 533 lbs. at Red Springs, and 455 to 565 lbs. at Iredell. The earliest varieties were Dozier Improved, King Improved, Hodge, Shine Extra Early Prolific, and Webb; the medium-maturing varieties, Culpepper Improved, Cook Improved, Excelsior Prolific, Peterkin Improved, and Edgeworth; and the later-maturing varieties, Russell Big Boll, Black Texas Wood, and Moss Improved. The highest percentage of lint was secured in Moss Improved, King Improved, Brown Texas Wood, Peterkin Improved, Cook Improved, Tool Early Prolific, Excelsior Prolific, Brown No. 1, Edgeworth, and Mortgage Lifter. With these varieties in 1904, the percentage of lint to seed varied from 35.42 in Excelsior Prolific at Edgecombe to 43.03 per cent in Moss Improved at Iredell. Russell Big Boll, Culpepper Improved, Edgeworth, Doubleheader, and Brown No. 1 of the varieties tested possess the largest sized bolls and the largest seed. The average results of distance tests at Edgecombe and Red Springs during 4 years favor about 3½ ft. by 16 in. at Edgecombe and about 4 ft. by 16 in. at Red Springs, and the average results of 5 years at Iredell favor planting 3⅓ ft. by 16 in.

Notes on varieties of cotton tested in 1907 are given, varieties adapted to different sections of the State are enumerated, and cultural and improvement methods are suggested.

Rotation experiments with cotton, corn, cowpeas, and oats, W. R. Dodson (*Louisiana Stas. Bul. 111, pp. 3–15*).—These experiments were conducted at Baton Rouge and Calhoun. The fields were approximately 6 acres in size, and one-third of the area was planted each year to cotton, one-third to corn with cowpeas, and one-third to rust-proof oats followed by cowpeas the same season. In this rotation each plat of land produced in 3 years one crop of cotton, one of corn, one of oats, and two of cowpeas. One-half of each plat was fertilized and the other half was made dependent upon the rotation and the cowpeas for the maintenance of fertility up to 1907, when 150 lbs. of acid phosphate per acre was added to the cowpea crops. The cotton received 30 bu. per acre of compost made up of 2 tons of acid phosphate, 100 bu. of stable manure, and 100 bu. of green cotton seed, the corn received 30 bu. per acre of compost made up of 1 ton of acid phosphate, and the same quantities of stable manure and green cotton seed used for corn, the oats were fertilized with 200 lbs. of cotton-seed meal and 100 lbs. of acid phosphate per acre, and the cowpeas with 50 lbs. of acid phosphate and 50 lbs. of kainit.

At Calhoun the cotton yielded the largest money returns on both fertilized and unfertilized land. Oats and cowpeas closely approximated the value of the cotton crop on the unfertilized land. The average of 15 crops of fertilized cotton was 1,513 lbs. of seed cotton, as compared with 466 lbs. of seed cotton on the unfertilized part of the plat. The estimated cost of the fertilizer for cotton was $5.50, for corn $6, and for oats $2.95 per acre. The fertilizer applied gave an average gain of 1,047.8 lbs. of seed cotton, 21.99 bu. of corn, and 25.4 bu. of oats. The average yield of corn and oats amounted to 31.4 bu. and 41.8 bu., respectively, on the fertilized land, and 9.41 bu. and 16.4 bu., respectively, on the unfertilized soil. In the beginning of these tests the fertilizers used were applied without profit and even at a loss, but later when the soil had again been brought up to a certain degree of fertility good profits were secured.

The results of 10 years' work at Baton Rouge resulted in an average yield of 1,242.6 lbs. of seed cotton, 45.1 bu. of corn, and 46.5 bu. of oats on the fertilized parts of the plat, as compared with 1,034.3 lbs. of cotton, 35.8 bu. of corn, and 35.2 bu. of oats on the unfertilized portion of the plat. The largest money value, $47.42 per acre, was secured from cotton, as against $43.92 from oats and

peas, and $41 from corn and peas, counting cotton at 10 cts., oats at 45 cts., corn at 60 cents., hay at $14, and cotton seed at $14.

Several plans for rotations are outlined and notes are given on the culture of oats in Louisiana.

Grain without irrigation, G. H. True (*Nevada Sta. Bul. 63, p. 25*).—Winter barley grown without irrigation gave a yield of 23 bu. of grain per acre. Spring-seeded White Australian wheat without irrigation yielded 9.4 bu., Velvet Don 12 bu., Beardless barley 16 bu., and rye 14 bu. per acre. The author believes that by properly handling the land in certain localities of the State fair crops of grain may be grown without irrigation.

The systematic classification and naming of grain varieties for practical purposes, von Rümker (*Jahrb. Deut. Landw. Gesell., 23 (1908), No. 1, pp. 137–160*).—This article proposes and discusses schemes for the classification and naming of varieties and strains of rye, wheat, barley, and oats. The terms "Landsorte," "Veredelte Sorte," "Hochzucht," "Neuzüchtung," "Originalsaatgut," and "Nachbau" used by German seed breeders and seed dealers are defined.

Alfalfa, J. M. Westgate (*U. S. Dept. Agr., Farmers' Bul. 339, pp. 48, figs. 14*).—This publication, which is to supersede Farmers' Bulletin 215 (E. S. R., 16, p. 965) discusses the history and present condition of alfalfa in the United States, describes the plant and the conditions to which it is adapted, enumerates the requirements for securing and maintaining a stand including general cultural directions, and discusses the utilization of the crop for various purposes. Notes are also given on growing winter grain in alfalfa fields, the effect of alfalfa culture on the land, the adaptability of the crop to rotations, methods of breaking up alfalfa sod, and alfalfa seed production. Descriptions of the different types of alfalfa now grown in the United States are presented, methods of combating the enemies of the plant are outlined, and special instructions for growing alfalfa in different sections of the United States are given.

Alfalfa investigations, S. C. Dinsmore (*Nevada Sta. Bul. 63, pp. 37–39*).—In 1906 a study of alfalfa was begun to determine the variations in chemical composition at different stages of growth. Samples were taken at intervals of a week from April 16, when the plant was 3 in. high, until September 1, just after the flowering stage. Analyses of samples collected to July 30 are reported.

Data for the international commission for the improvement of barley (*Wchnschr. Brau., 24 (1907), Nos. 40, pp. 534–542; 41, pp. 569–574*).—Studies on the distribution and grouping of the chemical constituents in the barley plant are reported in detail, with a summary of the results.

It is shown that the proportion of hull and the structure of the hulls apparently bear no relation to the protein content of the grain. The structure of the hulls is considered a constant variety characteristic. A high proportion of hull is regarded as typical of all barleys with a 1,000-grain weight as dry matter of less than 36 gm. In spring varieties having a 1,000-grain weight above 36 gm. the proportion of hull was not found to vary widely. Early varieties are said to contain 8 per cent of hull and late varieties about 9 per cent. The highest proportion is found in the winter varieties. Early or late seeding and a short or long growing period influenced this factor. Thin hulls, which are most common in seasons of normally early maturity, increase the possibility of injury to the grain in threshing. Fertilization, cultivation, and the distance between drills have no influence on the development of the hulls.

A protein content of 8 per cent is regarded as typical for a normally nourished crop, and deviations from this percentage are considered as abnormal and as due to irregularities in the metabolism of the plant. The fat content in pure varieties under normal conditions constitutes about 2 per cent of the dry matter.

Variations from this figure result from physiological causes, being associated with a high content of carbohydrates or of ash. Salts retard fat formation, while the lack of salts, and especially of alkalis and lime, promote it.

The normal ash content is about 3 per cent of the dry matter. The ash is reduced when the plant is insufficiently nourished, and an abnormally high ash content is attributed to overfeeding with salts or to too early ripening.

A new basis for barley valuation and improvement, A. MANN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 16, pp. 8, figs. 3*).—From the investigations described the author concludes that the diastatic and cytatic starch ferments in barley are wholly a product of the scutellum and are secreted by its epithelial layer. While a minute trace of these ferments is found in the starch cells, this is practically negligible because it plays so slight a part in the normal starch conversion. It is stated that the aleurone layer has nothing whatever to do with this process.

The results of these investigations further led to the conclusion that a broad, circular, slightly convex type of scutellum, having long, narrow epithelial cells, is a characteristic of the best grades of malting barley, while a narrow, deep sunken type, with short and broad epithelial cells is indicative of barley inferior for malting purposes. This correlation is considered of value as furnishing a means of recognizing the grade of any variety of barley, and also as pointing out that any improvement in malting barley must include an improvement of the scutellum.

The Mendelian and DeVriesian laws applied to cotton breeding, R. J. H. DELOACH (*Georgia Sta. Bul. 83, pp. 43–63, figs. 7, dgms. 2*).—Cook and Kilgore cottons were selected for breeding purposes, with the view of combining the good qualities of both varieties and to making an application of Mendel's law. Hybridization was begun in August, 1906, with the result that 9 capsules were secured with Cook as the mother variety and 3 capsules with Kilgore as the female parent. In 1907 the 9 capsules produced 140 plants, of which 115 were of the Cook type, 14 of the Kilgore type, and 11 of the hybrid type, while the 3 capsules produced 26 plants, of which 7 were of the Cook type, 18 of the Kilgore type, and 1 of hybrid character. The results of each series showed the dominance of characters of the female parent and, with some exceptions, very little breaking up of characters. The capsule coming nearest reaching Mendelian proportions produced 21 plants, of which 11 were of the Cook type, 5 of the Kilgore type, and 5 of hybrid type, and these plants were selected for further work.

Tests were made of single capsule, single plant, and progeny. Nine capsules were fertilized on one plant and three each on the other plants entering into the experiment. In the single capsule test 1,282 plants were produced, including of the Cook, Kilgore, and hybrid type 583, 334, and 365 plants, respectively. In the individual plant test 1,167 plants were secured, and of these 485 were of the Cook type, 411 of the Kilgore type, and 279 were hybrids. The results of the progeny test with 570 plants were 260 of the Cook type, 100 of the Kilgore type, and 210 were hybrids. It was found that variation in types occurred almost as often in the single capsule test as in the other two experiments.

In the case of plant 3 in the first experiment, all plants from the first capsule reverted to the male parent type, while all from the second capsule reverted to the female type and those from capsule 3 were ideal hybrids. The author states that should these experiments be continued all three experiments would be dropped except the hybrid types of capsule 3 in the first experiment. The results have shown that there is a great variation in the activity of different individual capsules, and that certain of these seem to approach fixation, and that every capsule on a hybrid plant will not always contain exact Mendelian

proportions. The author also concludes that these results were not due to mutation and that their occurrence can be explained through Mendel's law. A bibliography covering the period from 1859 to the present day, representing the books and pamphlets consulted for the work in hand, is appended.

Reappearance of a primitive character in cotton hybrids, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 18, pp. 11*).—In a discussion of this subject the author points out that hybrids between the Kekchi cottons of Guatemala and varieties of the Sea Island and Egyptian series commonly show seeds with green fuzz in the first generation. As this character does not normally appear in either of the parental varieties, it is considered as probably an ancestral character of both of them. The fact that the green fuzz largely disappears in the second generation of the hybrid is taken as indicating that the recall of this character to expression in the first generation marks a preliminary stage in the process of conjugation. "The complete results of conjugation first become visible in the second generation, when the parental characters reappear in many combinations and gradations. . . . The practical point is that such departures from the parental characters in the first generation of a hybrid may not remain to detract from the value of later generations. Hybrids in which these undesirable primitive characters come into expression must be grown for at least two generations before selection can be effectively applied. The characters shown by the first generation do not afford any practical indication regarding the characters of the later generations."

British cotton cultivation, W. Dunstan (*Colon. Rpts., Misc.* [*Gt. Brit.*], *No. 50, pp. 46*).—Reports on the quality of cotton grown in the British possessions are presented. The regions considered are Cyprus in Europe, the Sudan, East Africa Protectorate, Uganda, Nyasaland Protectorate in East Africa, Rhodesia, Transvaal, Orange River Colony, Natal, and Cape Colony in South Africa, Gambia, Sierra Leone, Gold Coast, Lagos, Southern Nigeria, and Northern Nigeria in West Africa, the Seychelles, the Straits Settlements, the Federated Malay States, and British North Borneo in Asia, Australia, British New Guinea, the West Indies, British Guiana, Honduras, and Bermuda. These reports form an account of progress in native cultivation and experimental trials fostered and inaugurated largely by the British Cotton Growing Association.

An excellent quality of American cotton is reported as growing in the Zoutpansberg district of the Transvaal, and it is believed that American cotton has apparently proved successful in Nyasaland and Uganda.

Cotton production, 1907, W. M. Steuart and D. C. Roper (*Bur. of the Census* [*U. S.*] *Bul. 95, pp. 58, figs. 7, dgms. 4, map 1*).—This bulletin presents data with reference to the annual cotton production in the United States as returned by ginners and delinters, distributed by States from 1899 to 1907 and by counties from 1903 to 1907; statistics as to annual production compiled from trustworthy sources of previous years beginning in 1790; figures on the world's cotton production in 1907 by countries; illustrated discussions on the growing, harvesting, and handling of cotton; and data regarding the production of cotton seed and the manufacture of and trade in cotton-seed products.

The total crop of 1907, including linters, is given as 11,425,156 running bales or bales as pressed at ginneries. The distribution of the crop was as follows: Upland cotton, square bales, 10,871,652; upland cotton, round bales, 198,549; Sea Island cotton, 86,895 bales, and linters, 268,060 bales. The average production of cotton in the United States for the last 6 years is 345,914 bales in excess of the crop of 1907.

Flax experiments, 1906 (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 3, pp. 423–440*).—The largest average yield of retted straw, 3,127 lbs. per

acre, was secured where 3 cwt. of kainit and 2½ cwt. of rape meal was applied during the winter. The average yield of scutched flax was also largest in this test, and the average returns from the scutched flax ranked first with £13 9s. 3d. The average returns from flax and tow per acre amounted to £13 16s. 1d. The cost of the manure in this experiment amounted to £1 and the profit per acre from the use of the manure to £3 6s. 1d., being a greater return than that secured from any other application in the test. On the manured plats receiving potash in some form no yellowing took place.

Experiments with Dutch and Riga seed were conducted at 8 centers. The Dutch seed consisted of Riga Child imported from Holland and a Belfast brand of Dutch seed, and the Riga seed consisted of Pernau Crown imported from Russia and a Belfast brand of Riga seed. The Dutch seed gave better returns than the Riga seed. The Riga Child seed imported from Holland produced the higher yield of straw and fiber at 5 centers of the 8, but the average returns were in favor of the Belfast brand of Dutch seed. At 6 centers Pernau Crown seed proved more profitable than the Belfast brand of Riga seed.

A test on the rippling of green straw resulted in a balance against rippling of 2s. 5d. in net returns per ton of green straw. When the straw is rippled the seeds suitable for feeding purposes are saved from the green bolls. The profitableness of rippling is dependent almost entirely on the amount of seed carried by the crop.

Jute and jute substitutes from West Africa (*Bul. Imp. Inst., 6 (1908), No. 2, pp. 126–135*).—Samples of jute and jute substitutes, including *Hibiscus esculentus*, *H. quinquelobus*, *H. lunariifolius* (?), *Honckenya ficifolia*, and *Urena lobata* were examined and their chemical composition is reported. The samples were secured from Sierra Leone, Northern and Southern Nigeria, and Gambia.

Report on field trials on varieties of mangel (*Midland Agr. and Dairy Col. Bul. 6, 1907–8, pp. 53–63*).—Prizewinner and Red Intermediate produced the largest yield but with a low percentage of dry matter, while Sugar Mangel and New Golden King gave the smallest yield but with the highest percentage of dry matter of any in the test. Golden King had the lowest percentage of roots gone to seed and Sugar Mangel the highest. The varieties recommended for the Midlands are Prizewinner, Red Intermediate, and Normanton Globe, the yields for these varieties in these experiments being 30 tons 2 cwt., 30 tons 1¼ cwt., and 25 tons 15¼ cwt., respectively.

The origin of the cultivated potato and the bud variations of wild tuber-bearing solanums under cultivation, E. Heckel (*Sur les Origines de la Pomme de Terre Cultivée et sur les Mutations Gemmaires Culturales des Solanum Tubérifères Sauvages. Marseilles, 1907, pp. 82, pls. 8, figs. 17*).—The history of the potato is given and the author's observations on different wild solanums under cultivation are presented. *Solanum commersonii* and its wild varieties did not undergo any variation at Marseilles. It is stated that bud variation gives to the species much greater vigor so that all parts increase in size, that the flowers as well as the tubers enlarge and change in color, and that even the form of the fruits which sometimes appear on the mutations while the type species remain sterile may be modified. The products of these mutations, although from very different types, resemble each other morphologically much more than those from the original types.

The dry matter and starch content of potatoes, S. Hals (*Tidsskr. Norske Landbr., 14 (1907), No. 11, pp. 464–469*).—Analyses of 66 samples of Norwegian potatoes show that the starch content increases with the dry matter content. Potatoes containing from 16 to 17 per cent of dry matter contained 67.4 per cent of starch in the dry matter, and potatoes containing over 23 per cent of dry matter contained 73.9 per cent of starch in the dry matter. Nonstarchy

solids ranged from 5.39 per cent in the potatoes with low dry matter content to 6.49 per cent in the potatoes with high dry matter content. The percentage of ash and fiber did not vary much, but the content of other nonnitrogenous substances increased with the dry matter.

Experiments with barnyard manure and commercial fertilizers for potatoes, 1904–1907, W. Christie (*Ber. Hedemarkens Amts Forsögsstat. Virks., 3 (1907), pp. 5–51*).—The data secured in 28 different series of fertilizer experiments with potatoes showed that the best general results were obtained from 200 kg. of 20 per cent superphosphate and 100 kg. of 37 per cent potash salt applied with 70,000 kg. of barnyard manure per hectare. The same application with the potash omitted apparently increased the starch content to some extent. An application of 350 kg. of 20 per cent superphosphate, 200 kg. of 37 per cent potash salt, and 160 kg. of sodium nitrate per hectare produced as heavy yields as the use of 70,000 kg. of barnyard manure, but gave a somewhat higher starch content than the use of the manure alone.

[Trials with sugar beets and potatoes] (*Univ. Col. Reading, Agr. Dept. Bul. 2, pp. 12*).—Cooperative sugar beet experiments were made with the Kleinwanzleben and Improved White varieties. The yield of roots ranged from 12½ to 24½ tons per acre, Improved White being the better yielder. The sugar content of the roots varied from about 16 to 18 per cent, Kleinwanzleben being generally the better of the two varieties.

The varieties of potatoes compared belonged to the Up-to-Date, Maincrop, Imperator, and Abundance groups. In the Up-to-Date group 1 oz. of seed potatoes produced on an average 1 lb. of crop in the first year, and 0.77 lb. in the following season. The next best yield was obtained in the Imperator group, being 0.87 lb. per ounce of seed potatoes the first year and 0.51 lb. the second. Results with Irish, Scotch, and English seed potatoes in all trials showed that the best and largest crops were obtained from the Irish and the second best from the Scotch strain.

Experiments on the defoliation of sugar beets, F. Strohmer, H. Briem, and O. Fallada (*Mitt. Chem. Tech. Vers. Stat. Cent. Ver. Rübenz. Indus. Osterr.-Ungar., No. 198, pp. 1–12*).—After briefly reviewing the results obtained by different investigators along this same line, the authors present and discuss the data secured in their own work. Beets were grown on 5 plats, the seed being planted April 6, and the crop being hoed on April 17, May 6 and 20, and June 6. On the last-mentioned date the beets were thinned and a top-dressing of nitrate of soda was given.

The comparable results on the different plats were as follows: Plat 1, defoliated July 12, produced 40.25 kg. of leaves and 110.2 kg. of roots; plat 2, defoliated July 30, 41.50 kg. of leaves and 104.3 kg. of roots; plat 3, defoliated August 24, 37.50 kg. of leaves and 132.5 kg. of roots; plat 4, only partially defoliated on August 24, 38 kg. of leaves and 126.5 kg. of roots; and plat 5, on which the plants were allowed to retain their leaves, 50.60 kg. of leaves and 174 kg. of roots. The conclusion is drawn that complete, as well as partial, defoliation of the sugar beet reduces total yield as well as sugar production, and that this reduction is greatest when the leaves are removed immediately preceding that period of growth in which the greatest sugar formation in the leaves takes place, which is about the end of July and the beginning of August. It was further found that early and complete defoliation increased the ash content and the crude fiber of the roots and in general reduced their quality. Defoliated beets showed about the same changes that are shown in beets grown with insufficient light. The data also indicate that the oxalic acid content of the dry matter of the leaves is considerably higher during all phases of the

development of such sugar beets than in the dry matter of the leaves of normally developed mature sugar beets.

Beet sugar, Z. C. ELKIN (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 445–455*).—Statistics for the manufacture of beet sugar as reported in the censuses of 1880, 1900, and 1905, with the percentages of increase from 1900 to 1905, are reported and historical notes on the industry are given. According to a summary presented in tabular form the number of establishments in 1905 was 51, the capital invested $55,923,459, and the value of products $24,393,794. Data on the industry in the different States are given in tables.

Experiments with seedling and other canes in the Leeward Islands in 1906–7, F. WATTS ET AL. (*Imp. Dept. Agr. West Indies Pamphlet 50, 1907, pp. 53*).—A summary is here given of the results of experiments with varieties of sugar cane carried on in Antigua and St. Kitts during 1906–7. The work was conducted on 8 estates in each island for the purpose of finding varieties likely to increase the output of sugar and showing greater resistance to insect pests and plant diseases.

In Antigua good results as plant canes were obtained with Sealy Seedling, D 109, D 625, B 208, and B 156. As rattoons, Sealy Seedling, B 156, B 376, and D 109 gave the best results in the order named. B 208 did not seem to commend itself as a rattoon cane on much of the sugar land.

In St. Kitts, B 208, D 116, and Sealy Seedling gave the best results as plant canes. B 208 and D 116 also stood first and second, respectively, in average yield for the past 7 years. As rattoons these same two canes ranked first the past season, being followed by Mont Blanc and D 74. Sealy Seedling occupied twelfth place in average results among the rattoons in 1906–7.

In Antigua 26.2 per cent of the total sugar acreage of the island is now devoted to the newer varieties, while in St. Kitts the newer canes already occupy 71 per cent of a total of 7,516 acres.

Manurial experiments with sugar cane in the Leeward Islands in 1906–7, F. WATTS ET AL. (*Imp. Dept. Agr. West Indies Pamphlet 51, 1908, pp. 43*).—Experiments have been started on rattoon canes following plant canes which have received no commercial fertilizers. These tests are known as the new series, while the old series consists of experiments in progress on rattoon canes following plant canes which have received commercial fertilizers.

In the nitrogen series of tests the most remunerative returns were secured where 40 lbs. of nitrogen per acre was given in the form of nitrate of soda and used in conjunction with potash and phosphate. Without the use of potash and phosphate the nitrogenous fertilizers also proved profitable. The use of dried blood was unsatisfactory. This season superphosphate afforded better results than basic phosphate, but even in this form it did not appear remunerative. The use of moderate quantities of potash proved beneficial, and small dressings of 20 lbs. of potash per acre were as satisfactory as larger doses. The use of guano gave an insufficient increase in the crop to cover the expense of its application.

The average results in the old series of experiments during 7 years are regarded as showing fairly conclusively that in Antigua and St. Kitts nitrogen is of the greatest value to the rattoon crop and that the requirements are met by the use of from 2 to 2¾ cwt. of sulphate of ammonia per acre or from 2½ to 3½ cwt. of nitrate of soda given in one application; that potash is doubtfully remunerative and if used should not exceed in quantity 20 lbs. per acre, and that phosphates are not profitable. These statements presuppose that when the land was prepared for plant canes it was manured with about 20 tons per acre of good barnyard manure or its equivalent.

Report on field trials on varieties of swedes (*Midland Agr. and Dairy Col. Bul. 7, 1907–8, pp. 67–78*).—In general the bronze-top varieties outyielded the purple-top sorts. Ne Plus Utra, which ranked first in yield and dry matter, produced 19 tons 17 cwt. of roots and 3,633 lbs. of dry matter per acre. It is regarded as the best swede for the Midlands.

Report on field trials on manuring of swedes (*Midland Agr. and Dairy Col. Bul. 4, 1907–8, pp. 27–40*).—The results here reported show that a dressing of 191 lbs. of nitrate of soda, 520 lbs. of superphosphate, and 60 lbs. of sulphate of potash per acre was the most profitable application. A small dressing of barnyard manure and commercial fertilizers gave a larger crop than the use of manure alone either in small or in large dressings. Basic slag and superphosphate proved to be the best sources of phosphate for swedes, and dissolved bone and bone meal the least satisfactory. It was found that if part of the nitrogen is applied after thinning it is best to supply that given at seeding in the form of sulphate of ammonia, and that if all the nitrogen is given as nitrate of soda it is advisable to apply it all at the time of sowing.

Propagation of tobacco in Cuba, C. F. Baker (*Estac. Cent. Agron. Cuba Bul. 10, English ed., pp. 22, figs. 8*).—This bulletin is a popular treatise on tobacco culture under Cuban conditions. The subjects discussed are seed selection, varieties, seed beds and their preparation, planting, and transplanting.

Tobacco (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 553–579*).—In this report the manufacture of tobacco is divided into two principal groups, cigars and cigarettes, and chewing and smoking tobacco and snuff. A summary of the statistics of the combined industry from 1860 to 1905, with percentages of increase, shows that in 1905 the number of establishments was 16,828, the capital invested $323,983,501, the cost of materials used $126,088,608, and the value of products $331,117,681. Tabulated statistics are given by States, Territories, and geographic divisions.

The perennial sow thistle and some other weed pests of 1908, J. E. Howitt (*Ontario Dept. Agr. Bul. 168, pp. 24, figs. 26*).—This bulletin presents information regarding the perennial sow thistle (*Sonchus arvensis*), bladder campion (*Silene inflata*), stinkweed (*Thlaspi arvense*), Russian thistle (*Salsola kali tragus*), field pepper grass (*Lepidium campestre*), dodder (*Cuscuta epithymum*), and the orange hawkweed (*Hieracium aurantiacum*), with a view to aiding in checking or exterminating these various weeds which are spreading rapidly over Ontario. Special attention is given to the perennial sow thistle and five different methods for combating it are outlined.

HORTICULTURE.

Forcing plants by warm baths, H. Molisch (*Umschau, 12 (1908), No. 39, pp. 771–773, figs. 4; abs. in Sci. Amer. Sup., 66 (1908), No. 1714, p. 298*).—The author investigated a method used by certain practical gardeners in forcing plants by means of warm water. The method consists in soaking cut branches or rooted plants of various trees and shrubs in warm water for from 9 to 12 hours, and then growing them in the usual manner.

In November, 1907, 3 freshly cut branches of Forsythia were immersed for 12 hours in water, the temperature of which varied between 77 and 90° F. These were then placed in a hothouse with their cut ends in water, together with 3 branches which had not been immersed. In 12 days' time the bathed branches were in full bloom while all the buds on the other branches still remained closed. A rooted lilac bush immersed for 12 hours in hot water at a temperature of 88 to 98° F. was afterwards placed in a moderately warm forcing house with a temperature of 59 to 64° F. Forty days after the bushes were

in full leaf and flower, whereas the buds on an untreated bush were just beginning to open. A portion of the young catkins on a hazel stem with many branches was immersed in hot water for a period of 12 hours while the remaining catkins remained dry. Six days later the bathed catkins attained their full development while the unbathed catkins showed no perceptible change. A similar experiment with Forsythia emphasized the local character of the influence of the warm bath.

It was also found that if the bathed branches or plants are not placed at once in the forcing house, but are first exposed to the open air for 2, 3 or 4 weeks, under ordinary autumn or winter conditions, and are then cultivated in the hothouse, the bathed portions show the same advance over the unbathed portions as though they were placed in the hothouse immediately after the bath. This process is applicable to the hazel, lilac, dogwood, gooseberry, larch, black alder, horse chestnut, willow and other plants and immersion from 6 to 12 hours is generally sufficient. Plants bathed beyond 12 hours are likely to suffer from lack of oxygen.

The temperature of the bath varies with different plants. Hazel, Forsythia, gooseberry, and lilac are sufficiently stimulated by a bath at 86° F., whereas a temperature of 95 to 104° F. is better for the horse chestnut and appears to be necessary for the black alder and birch. Some plants appear to be influenced by the warm bath immediately after the leaves fall; other plants must first go through a period of rest. On the other hand, the effect of the bath gradually diminishes toward the end of the winter rest period. A warm bath in autumn was found to produce immediate effect on the male catkins of the hazel, whereas the leaf buds could not be stimulated by a warm bath until January. It is believed that this method will prove of practical value to florists in forcing shrubs.

Distribution of seeds and plants, E. J. Wickson and R. E. Mansell (*California Sta. Seed Bul. 1908–9, pp. 6*).—A tabulated statement on the distribution of seed made by the station from 1902 to 1908 is given, the aims and methods of the work are pointed out, and a number of garden vegetables and fruits are described.

Ginseng and other medicinal plants, A. R. Harding (*Columbus, O., 1908, pp. 317, pls. 2, figs. 87, dym. 1*).—This popular work contains a considerable amount of information compiled from various sources relative to the technical and common names, habitat, range, botanical characteristics, collection, prices, and uses of a large number of medicinal roots, barks, and leaves. Particular attention is paid to the culture of ginseng and Golden Seal. Illustrations are given of the plants under discussion.

Orchard fruits in the Piedmont and Blue Ridge regions of Virginia and the South Atlantic States, H. P. Gould (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 135, pp. 102, pls. 4*).—This is the first report on a series of fruit district investigations which the Bureau of Plant Industry is conducting. It discusses the physical and climatic conditions of the Piedmont and Blue Ridge regions and contains notes on the range and behavior of a large number of varieties of apples, pears, peaches and plums grown therein. The varieties of apples and peaches are also grouped according to their behavior at different altitudes in different latitudes, and phenological records compiled from the observations made of some of the more important varieties of fruits by a large number of fruit growers are given. The text is accompanied with a map showing the pomological regions of the South Atlantic States.

Although the study has not been continued sufficiently long to warrant many definite deductions, it is believed that the information presented will prove of value to prospective orchard planters.

Orchard report of Baton Rouge Station (*Louisiana Stas. Bul. 112, pp. 3–49, figs. 14*).—This report summarizes the observations made on the varieties of orchard and small fruits tested in the station orchard at Baton Rouge since its establishment in 1889–90. The report concludes with a discussion of orchard pests and diseases and their control, and orchard fertilizers. It is believed that the observations are sufficiently complete to prove of value to those interested in fruit culture upon the bluff soils of the State.

[Reports of the fruit experiment stations], H. L. Hutt et al. (*Ann. Rpt. Fruit Expt. Stas. Ontario, 14 (1907), pp. 19–94, figs. 9, map 1*).—A progress report on the work of variety testing at the various fruit experiment stations throughout Ontario, including separate reports by the experimenters in charge of each station. In the appendix are given lists of the varieties of fruits recommended to be grown for market in the province, including lists of varieties especially adapted to the sections represented by each station.

Fruit culture, A. Gomes do Carmo (*O Brasil: Suas riquezas naturaes; suas industrias. Rio de Janerio: Centro Indus. Brasil, 1908, Portugese ed., vol. 2, pp. 335–378*).—An account is given of the present status of fruit culture and wine making in Brazil including descriptive lists of tropical and acclimatized fruits adapted to that country.

The influence of peat mull on the root development of young fruit trees, Yunge (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1907, pp. 78, 79, fig. 1*).—Finely divided peat dust saturated with liquid manure and worked into the soil in a similar manner to that used with stable manure was found to produce a strong fibrous root growth with young fruit trees. As a result of this trial the station recommends the use of peat mull to nurserymen.

May weather and fruit harvests, F. H. Hall (*New York State Sta. Bul. 299, popular ed., pp. 2–8*).—A popular edition of Bulletin 299 of the station previously noted (E. S. R. 20, p. 41).

Investigations on the life activities of stored fruits, O. Schneider-Orelli (*Landw. Jahrb. Schweiz, 22 (1908), No. 10, pp. 545–563*).—The author briefly reviews the literature on this subject and reports on several respiration and transpiration experiments conducted with fruit stored in bright and dark locations, together with experiments on the respiration of injured stored fruits.

Sunlight, through its warming effect, was found to increase both the respiration and transpiration of stored fruit and should not be allowed to enter the storage place. Diffused daylight on the other hand did not appear to materially influence the life activities of stored fruit. Where there was injury to the fruit, however, a respiration acceleration was evident for several days.

Seedless grapes and orchard fruit, H. Müller-Thurgau (*Landw. Jahrb. Schweiz, 22 (1908), No. 10, pp. 564–597, figs. 7*).—A study of the recent literature on this subject with an account of recent observations made by the author. The subject is discussed under the following general headings: The occurrence of parthenocarpie with pip fruits, the importance of parthenocarpie for the orchard, parthenocarpie with grapes, conditions favorable to the development of seedless fruits, and the influence of the seed upon the size, shape and inner structure of the fruit. A bibliography is appended.

Fertilizer experiments with grapes, E. Zacharewicz (*Rev. Vit., 30 (1908), No. 770, pp. 313–318*).—A further report on fertilizer experiments being conducted with grapevines on different soils in the department of Vaucluse. Practically the same conclusions are reached as in the work previously noted (E. S. R., 19, p. 946).

Viticulture in the department of Constantine, H. Perruchot (*Bul. Off. Gourt. Gén. Algérie, 1908, No. 20, Sup., pp. 239–275*).—A report on viticultural conditions in Constantine, Algeria, relative to the methods of combating the

phylloxera and the reconstitution of the vineyards with American stocks. Notes are given on those stocks which have shown the best results together with varieties of French grapes adapted for grafting on these stocks, data on the cost of replanting vineyards, and the production and commerce of wine.

Coffee, S. F. RANGEL (*O Brasil: Suas riquezas naturaes; suas industrias. Rio de Janeiro: Centro Indus. Brasil, 1908, Portuguese ed., vol. 2, pp. 1–103*).—An account of the coffee industry with special reference to coffee culture in Brazil including data relative to the history, botany, chemical composition, physiological properties and distribution of coffee, the climate and soil requirements, cultural operations, insect pests, harvesting, drying, preparation for export, consumption, substitutes, and the cost of production, together with statistics on production, imports and exports for a large number of years.

Cacao, J. R. MONTEIRO (*O Brasil: Suas riquezas naturaes; suas industrias. Rio de Janeiro: Centro Indus. Brasil, 1908, Portuguese ed., vol. 2, pp. 217–229*).—An account of cacao culture in Brazil including statistics on production and exports of cacao.

In defense of chestnut groves, I. GIGLIOLI (*A Difesa dei Castagneti. Rome, 1908, pp. 3–163*).—A report of an investigation relative to the present condition of the chestnut groves in Italy, the extent to which they have been damaged by the manufacture of tannic acid from chestnut wood, and suggestions for the extension of chestnut culture and protective measures for the future.

Pecans and other nuts in Texas, R. T. MILNER (*Texas Dept. Agr. Bul. 2, pp. 5–48*).—This is a compilation of papers on various phases of pecan culture and nut culture in general, presented with a view of stimulating nut culture in Texas. The papers were selected chiefly from the papers and addresses of the Texas Nut Growers' Association and have been classed under the following general headings: General directions for pecan culture; the best pecan; transplanting, budding, and grafting; top-working; walnuts; and marketing pecans.

Budding new tops on pecan trees, H. H. HUME (*Amer. Fruit and Nut Jour., 5 (1908), No. 90, pp. 8–11, figs. 7*).—An illustrated discussion of the method of top-working pecan trees by the use of annular buds, including data on the cost of the operation and a discussion of the advantages of top-working by cutting back and budding.

Shade trees, E. A. START, G. E. STONE, and H. T. FERNALD (*Massachusetts Sta. Bul. 125, pp. 3–64, figs. 34*).—This bulletin, which was prepared and published jointly by the Massachusetts Agricultural Experiment Station and the Massachusetts Forestry Association, discusses various questions relative to shade trees and their management, including the law of shade trees in the highway and street and on private property, the tree warden's outfit and duties, the characteristics and value of the more important species of shade trees and their adaptability for different environments, transplanting and pruning, tree surgery and tree guards, the injurious effects of gas and electricity and methods of prevention. In conclusion the more important insect enemies are figured and described and the best-known methods of treatment are given.

Shade trees for North Carolina, W. W. ASHE (*N. C. Geol. and Econ. Survey Bul. 16, pp. 72, pls. 10, figs. 18*).—This bulletin is published with the view of stimulating and encouraging judicious planting of shade trees in North Carolina and contains suggestions relative to the time and method of planting, pruning, care of newly planted trees, general suggestions for street planting, and the arrangement and combination of trees for various purposes. Descriptions are given of the majority of shade trees suitable for street and park planting in different sections of the State. The advantages to be derived by judicious street tree planting are further emphasized by means of illustrations.

Gardens old and new, edited by H. A. TIPPING (*New York and London, [1908], pp. XI+346, pl. 1, figs. 397*).—This is the third of a series of volumes, all of which portray English country homes and their garden environments. The present volume contains about 400 photographic illustrations with descriptive text.

Gardening for women, FRANCES G. WOLSELEY (*New York and London, 1908, pp. XV+289, pls. 32, figs. 13*).—A popular work in which the author draws attention to the qualifications of women for taking up various phases of gardening, points out the advantages to be derived by employing them, and outlines their position in supplementing and increasing the work done by male gardeners. Several chapters of the book are devoted to syllabuses of colleges and schools in Great Britain and elsewhere, which are deemed of value in training women for gardening pursuits.

Window gardening, H. B. DORNER (*Indianapolis, 1908, pp. 153, pl. 1, figs. 43*).—A practical work on window gardening in which the author discusses various forms of containers, potting methods, soils, watering, fertilizers, light, heat and ventilation, insect enemies, propagation by seed and by cuttings, and gives detailed directions for the culture of a large number of bulbs, foliage plants and flowering plants suitable for window culture.

Water lilies and how to grow them, H. S. CONARD and H. HUS (*New York, 1907, pp. V+228, pls. 31*).—A popular work containing directions for the culture of various kinds of water lilies, together with chapters on the making of ponds and the use of accessory plants. The relative values of the different varieties in the various groups are pointed out and lists are given of water lilies for special purposes.

FORESTRY.

Douglas fir: A study of the Pacific Coast and Rocky Mountain forms, E. H. FROTHINGHAM (*U. S. Dept. Agr., Forest Serv. Circ. 150, pp. 38, figs. 3*).—This circular discusses the history, distinguishing characteristics, silvical forms, geographical distribution, and silvical regions within the range of Douglas fir, together with the silvical characteristics and requirements of the two forms, and systems of management in the different silvical regions.

The author concludes that of the two forms of Douglas fir, one of which inhabits the region between the Cascades and Sierra Nevada and the coast, and the other the Rocky Mountain region, the coast form is superior for forest planting in almost every respect. The mountain form is better adapted for ornamental purposes or for regions where the climate is unfavorable to the growth of the coast form. Attention is called to the great desirability of selecting seed for future plantings from rapid-growing, straight, symmetrical trees.

The pine: Economic and statical investigations of the forest division, Eberswalde Forest Research Station, A. SCHWAPPACH (*Die Kiefer: Wirtschaftliche und Statische Untersuchungen der Forstlichen Abteilung der Hauptstation des Forstlichen Versuchswesens in Eberswalde. Neudamm, 1908, pp. IV+180*).—In addition to normal yield tables for the pine based upon studies of Prussian pine stands for the past 30 years, considerable tabular data are given and discussed relative to studies of the effect of various methods of culture and of different degrees of density upon the development of pine forests, assortment yield tables, and investigations on the productiveness of pine forestry under different systems of treatment.

In the appendix tables are given for different experimental areas in which the trees are classed according to their diameter at 1.3 meters (about 5 ft.) from the ground.

Production and consumption of basket willows in the United States for 1906 and 1907, C. D. MELL (*U. S. Dept. Agr., Forest Serv. Circ. 155, pp. 14*).—This is a statistical review of the basket-willow industry in this country based largely on brief reports from 161 domestic manufacturers of willow ware.

It is estimated that 2,282,000 lbs. of willow rods were consumed in this country in 1907 as compared with 1,798,000 lbs. in 1906. There was a slight advance in price for home-grown rods, particularly for the higher grades, in 1907, as well as a marked tendency on the part of manufacturers to either grow their own stock or to use domestic willows of high grade.

Forest economics—silviculture, L. GRANDEAU (*Ann. Sci. Agron., 3. ser., 3 (1908), I, pp. 372–438; II, No. 1, pp. 1–156*).—Résumés and in some cases full reports are given of a large number of papers presented before the section of forest economics and silviculture of the Eighth International Congress of Agriculture at Vienna in 1907. In Volume I are considered creation and treatment of forests from the standpoint of production and quality, the cultural importance of acclimatized varieties of our forest species, and the utility of and favorable methods of afforesting pine lands. The reports in Volume II deal with studies by research stations on wood transportation and the utilization of wood for construction purposes, remedial measures against injuries to forests from industrial fumes and insects, new tendencies and methods in forest management, the basis of an equal tax on wood properties, legislative measures for the protection of landscapes and natural areas, wood commerce in Europe and the influence of good roads on this commerce, international unification of units of measure and standards of sorting for building timber, and the use of beech wood in the chemical industries.

On the preservation of seeds of deciduous trees, C. VANDERBISSE (*Ann. Gembloux, 18 (1908), No. 10, pp. 559–585*).—A thesis in which the author discusses the factors influencing seed germination, reviews the various processes employed for saving the seed of the principal hardwood species, and presents data on the preservation of acorns by several different methods. A brief bibliography is appended.

On the combating of hardpan by cultural methods, N. VON LORENZ (*Zur Bekämpfung des Ortsteines durch Kulturelle Makregeln. Vienna, 1908, pp. 3–23, figs. 5*).—The forestry experiment station at Mariabrunn is conducting experiments with a view of rendering hardpan soils suitable for forestry. A detailed account is given of the results secured to date with plantations of oak, beech, white pine, fir, and locust set out in 1904. Chemical fertilizers and green manures have been used with the plats. The results thus far indicate that with the methods used hardpans not much more than 20 cm. (about 8 in.) thick can be improved sufficiently to grow profitable stands of spruce, white pine, oaks and eventually locust, and possibly beech.

The principles of spacial arrangement in forests, C. WAGNER (*Die Grundlagen der Räumlichen Ordnung im Walde. Tübingen, 1907, pp. V+320, pl. 1, figs. 43*).—In this work the author examines in detail the various phases of forestry, including silviculture, forest protection, utilization, and management, relative to their requirements with respect to space arrangement, with a view of formulating principles for the development of a system of forest management which shall provide for a separate and independent consideration of space and time. This the author believes can be best accomplished by natural regeneration over very restricted areas, and he advocates the selection strip method of felling, "Blendersaumschlag," which provides for cutting the mature wood in progressive narrow strips on the side of the forest which presents the most favorable conditions for the natural regeneration of the trees.

Annual report of the director of forestry of the Philippine Islands for the period July 1, 1906, to June 30, 1907, G. P. AHERN ET AL. (*Philippine Bur. Forestry Rpt. 1907, pp. 5–37, maps 2*).—This report includes a report of the second annual conference of the foresters of the Philippine Bureau of Forestry with a list of recommendations adopted at the conference relative to various phases of the work; a report of the committee on free use privileges with a proposed amendment to the Free-Use Act designed to regulate the abuse of privileges granted under the act; considerations relative to the present status and possible development of lumbering operations; and an outline of the work of the bureau in investigating the amount, character, value, and uses of the Philippine forest products. Tabular statements are given of the licenses and applications granted for lumbering, clearings, and homesteads, utilization of forest products, amount of timber taken by leading licensees, import and export of lumber, revenues, and expenditures.

Desirable tracts of public forests are said to be available and unoccupied in several of the provinces. Maps of these districts have been made and estimates prepared showing the stand, varieties of merchantable timber, possibilities of logging, etc. Available forest tracts in Negros Occidental, and northeastern Mindoro, together with a report of an examination of pine lands tributary to Baguio, Province of Benguet, are considered in the present report.

Report of the conservator of forests, C. E. LEGAT (*Transvaal Dept. Agr. Ann. Rpt. 1907, pp. 178–192*).—An account of nursery and planting operations conducted at the various forest centers including a financial statement for the year.

The royal Bavarian forestry administration and its historical development in the nineteenth century, J. KEIPER (*Forstw. Centbl., n. ser., 29 (1907), No. 9–10, pp. 499–531, pl. 1; 30 (1908), Nos. 2, pp. 61–76, pl. 1; 3, pp. 121–141; 4, pp. 181–199, pl. 1*).—From the standpoint of management the author divides the Bavarian forest administration into four well-defined periods of development which are discussed in their order as follows: From 1803 to 1821; 1822 to 1853; 1853 to 1855; and 1855 to the present time.

Report on the history of the woodlands of the town of Ettlingen, M. SEEGER (*Karlsruhe, 1908, pp. 90, map 1*).—A thesis on this subject accepted by the Grand-ducal Technical High School at Karlsruhe for the degree of doctor of engineers. The work includes a historical account of the Ettlingen forests relative to their management, forest policy, protection, exploitation, etc. A brief bibliography is appended.

Annual report on the literature and important happenings in the realm of scientific forestry, forest zoology, agricultural chemistry, meteorology and forest botany for the year 1907, H. WEBER (*Allg. Forst u. Jagd Ztg., 1908, Sup., pp. 89*).—This report contains abstracts of the important literature on the various phases of forestry together with notes on important occurrences in the forest world for the year 1907. The topics included are silviculture, utilization, management, valuation and statics, the theory of forest mensuration and yields, administration, history, policy, statistics, news of forest unions and hunting clubs, zoology, botany, and soil physics.

DISEASES OF PLANTS.

Observations on the biology of Botrytis cinerea, F. T. BROOKS (*Ann. Bot. [London], 22 (1908), No. 87, pp. 479–487, figs. 4*).—A study was made of *B. cinerea* to determine if possible the conditions under which it is able to infest its host plants. The conidia were found to develop and grow luxuriantly in gelatinized grape extract, and infection experiments were carried on with pure

cultures of the fungus applied to lettuce plants. Where the spores were placed directly upon uninjured leaves no infection took place, but wherever the leaves were wounded, either by tearing or burning with a hot platinum needle, infection ensued.

While carrying on these experiments, the author noted that the plants on which the leaves had begun to turn yellow were readily infected. Subsequent investigations, in which plants were kept for 5 days in the dark and spores placed upon them when the leaves were beginning to show signs of yellowing, showed that the fungus was readily introduced into otherwise sound tissues.

Another experiment was carried on in which lettuce was grown in cultures from which some of the supposedly essential organic constituents were omitted. After 6 weeks' growth in such cultures, the plants were inoculated by placing Botrytis spores upon the leaves, but without any infections.

In conclusion the author states that "whatever may be the causes at work in the living cell which confer immunity or predisposition on the species of host plant, or which confer virulence or impotence on the spore, they lie deeper than nutrition."

The physiology and development of some anthracnoses, C. W. EDGERTON (*Bot. Gaz., 45 (1908), No. 6, pp. 367–408, pl. 1, figs. 17*).—A study of some anthracnoses has been carried on to determine the perfect stage of as many forms as possible, to ascertain whether the forms of Gloeosporium found on the apple represent a single species or more than one, and to learn whether species of Gloeosporium may be distinguished by cultural methods. In the study the author investigated the anthracnoses of about 30 different host plants from 50 or more sources. The genera that are known to be connected with anthracnoses are Gnomonia, Glomerella, and Pseudopeziza.

From an economic standpoint, the most important species belong to the Glomerella type, which is distinctly separated from the other types of anthracnoses both by its perfect and imperfect stages. There seem to be a large number of closely related forms that are extremely variable. Furthermore, many forms vary under artificial cultivation and doubtless also under natural conditions. Some of these forms seem to be similar enough to be considered the same, while others are dissimilar enough to be classed as distinct species.

In relation to the forms occurring on the apple, there seem to be two distinct forms of anthracnose separated by thermal lines. That occurring in the southern part of the country differs in the presence of perithecia, a slightly different acervulus, and entirely different cultural characters. From his investigations the author is led to believe that too much dependence should not be placed on cultural characters for the determination of the species.

On the specialization of a form of Sphærotheca humuli, J. A. STEINER (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 22–23, pp. 677–736, pl. 1, figs. 3*).—Experiments by the author showed that there is a biological form of *S. humuli* occurring on various species of Alchemilla, and he describes it under the name of *S. humuli alchemillæ*. His experiments showed that there is little difference between infection by ascospores and by conidia of the fungus, and that of the form described several races exist capable of infecting some species of Alchemilla and not others.

The Sporotrichum bud rot of carnations and the silver top of June grass, F. C. STEWART and H. E. HODGKISS (*New York State Sta. Tech. Bul. 7, pp. 83–119, pls. 6*).—The carnation bud rot described by the authors is said to be identical with that discussed in Bulletin 103 of the Nebraska Station (E. S. R., 19, p. 855). It is known to occur in several greenhouses in New York, Illinois, and Nebraska, but it is not believed to be of great economic importance.

Carnations affected with bud rot are invariably infested with a fungus associated with a particular species of mite. The same fungus and mite are frequently found similarly associated on June grass (*Poa pratensis*). The relation of the mite to the carnation disease is not entirely clear, but it probably acts as a carrier of the fungus. The relation of the mite to the silver top of grass has not been investigated.

The fungus on the carnation has hitherto been given a different name from that on the grass, but as it was first described from the grass, the name should be *S. poæ* The mite, previously described as *Pediculoides dianthophilus* (E. S. R., 19, p. 860), has been positively identified as *Pediculopsis graminum.*

The authors of the present bulletin do not agree with Heald that the bud rot is necessarily a disease of neglected houses, as it has proved troublesome in a number of greenhouses on Long Island that are exceptionally well managed.

The smuts of cereals, their distribution and control, R. Falck (*Jour. Landw., 56 (1908), No. 2, pp. 173–182, pl. 1*).—This is a lecture presented before the Agricultural Society of Breslau, giving a summary of information regarding cereal smuts, their distribution, and means for control.

Rust in wheat, R. H. Biffen (*Jour. Bd. Agr. [London], 15 (1908), No. 4, pp. 241–253*).—After a general account of the life histories, destructiveness, and other characteristics of rusts, the author describes his breeding experiments with various wheats in seeking forms immune to rust, particularly to the yellow rust (*Puccinia glumarum*), a preliminary account of which has already been noted (E. S. R., 19, p. 44).

After finding a number of varieties of wheat that were practically immune to the yellow rust, hybridizing experiments were carried on between a variety of Club, an immune variety, and Michigan Bronze, a very susceptible variety. The cross-bred plants proved very susceptible to the disease, but a fair crop of grain was produced. A study of the material in subsequent generations showed that the head characters and immunity or susceptibility are unit characters that seem to be transmitted, and four fixed types have been secured, namely, immune Club, susceptible Club, an immune loose-headed variety similar to Michigan Bronze, and a susceptible variety of the same. Two of these varieties closely resemble the parents and two show fresh combinations of the characters present in the two parent plants. Further trials are being conducted with these varieties in order to demonstrate that the new character combinations are perfectly fixed. The immune varieties of wheat which have been raised in the course of these preliminary experiments have no particular value beyond their immunity.

During the process of the investigation an opportunity was offered to estimate the extent of damage caused by rust. Numbers of each type were harvested separately, and the yield of grain of the diseased plants compared with those in a healthy condition was in the ratio of 0.2 to 1.

Bean diseases in 1908, H. Querner (*Ztschr. Landw. Kammer Braunschweig, 77 (1908), No. 31, pp. 367, 368*).—During 1908 serious losses were occasioned by the occurrence of bean anthracnose (*Glæosporium lindemuthianum*) and red spiders (*Tetranychus telarius*). For the prevention of the first, the author recommends better drainage of the soil, with care in the selection of seed, and where seed is suspected of being diseased, treating it with a solution of ammoniacal copper carbonate. For the control of the red spider no definite means are described.

The more important diseases of cabbage in Holland, H. M. Quanjer (*Natuurk. Verhandel. Holland. Maatsch. Wetensch. Haarlem, 3. ser., 6 (1906), No. 2, pp. 1–84, pls. 8*).—After describing cabbage culture in the north of Holland, an account is given of some of the more important insect and fungus pests

to which the crop is subject. Among those mentioned are *Contarinia torquens*, *Anthonomyia* sp., *Baris* sp., *Phoma oleracea*, etc. In addition to these, descriptions are given of some troubles due to faulty cultivation.

Corky scab of potatoes (*Jour. Bd. Agr. [London]*, *15 (1908)*, *No. 8, pp. 592–599, pl. 1*).—A description is given of corky scab of potatoes caused by the fungus *Spongospora scabies*. This fungus is said to be abundant in Great Britain, Ireland, and Norway, and found to some extent in Germany.

Soaking diseased potatoes for 2 hours before planting in a solution consisting of ½ pt. of formalin in 15 gal. of water is recommended. The application of lime to the soil would probably aid in checking the disease.

Black scab in potatoes (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908)*, *No. 3, pp. 441–443, pl. 1*).—A description is given of the black scab, or wart disease, of potatoes, due to the fungus *Chrysophlyctis endobiotica*, which is apparently becoming very serious in parts of Great Britain. Preventive measures which include rotations in which potatoes do not occupy the soil for a considerable number of years are recommended.

An important new potato disease in Germany, G. Schneider (*Deut. Landw. Presse*, *35 (1908)*, *No. 79, p. 832, figs. 2*).—An illustrated account is given of the wart, or black scab, of potatoes due to *Chrysophlyctis endobiotica*, which has lately appeared in parts of Germany.

The occurrence of Chrysophlyctis endobiotica in Westphalia, A. Spieckermann (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 6 (1908)*, *No. 10, pp. 113–116, figs. 2*).—A description is given of the wart disease of potatoes due to *C. endobiotica*, together with suggestions for the prevention of the spread of that pest.

Recent investigations of potato diseases, and of diseases of potatoes and root crops during storage, F. K. Ravn (*Tidsskr. Landbr. Plantcarl*, *15 (1908)*, *No. 2, pp. 344–354*).

Fire blight in fruit trees, W. B. Mack (*Nevada Sta. Bul. 63, pp. 52, 53*).—Attention has been directed to a disease of apple trees. An examination showed that the trouble was of bacterial origin and that undoubtedly the organism is *Bacillus amylovorus*, the species which causes the bacterial blight of pears, apples, and quinces. The disease is said to be of common occurrence in the vicinity of the station and is causing material damage to the orchards. It is to be the subject of further investigation.

The leaf browning of sweet cherries in Germany, K. von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 6 (1908)*, *No. 6, pp. 330–332, figs. 3; abs. in Bot. Centbl., 108 (1908)*, *No. 14, p. 365*).—An account is given of a disease of sweet cherries, due to *Gnomonia erythrostoma*, which has recently made its appearance in the Bavarian Palatinate. The fungus has appeared in great abundance, causing a browning of the leaves, and is characterized by the leaves remaining attached to the trees during the winter. The spores are said to be 2-celled instead of 1-celled, as previously reported by Frank.

The effect of various copper preparations and other fungicides on the flowers of the grape, E. Molz (*Mitt. Weinbau u. Kellerw., 20 (1908)*, *No. 6, pp. 87–91, fig. 1*).—The effect of 2 applications of several fungicides and insecticides on the flowers of the grape was investigated. The treatments were made in June and July, intervals of about 10 days occurring between the applications. Among the substances employed were soda Bordeaux mixture, neutral copper acetate, azurin, a fungicide the formula of which is recommended by Vermorel, several dust preparations of Nordlinger, Nonnit, and sulphur, comparisons being made with Bordeaux mixture, a 1 per cent solution of which was used in the first spraying and a 2 per cent solution in the second.

The Bordeaux mixture did not injure either the leaves or the flowers, while the other liquid sprays were all more or less destructive of the flowers, and some injured the foliage as well. Nonnit destroyed a portion of the flowers and burned the leaves to a considerable extent. None of the fungicides used in a dry form proved injurious.

Gum disease of citrus trees in California, R. E. Smith and O. Butler (*California Sta. Bul. 200, pp. 235–272, figs. 14*).—According to the authors, the most common and characteristic citrus tree diseases in California are included under the general term gum disease, and the present bulletin considers various citrus troubles, showing the features which they have in common and discussing their nature, together with means of prevention and cure.

Gum disease, or gummosis, is a term applied to a condition in which an exudation of a gummy sap takes place through the bark. The disease is attributed to various causes, but so far as known it is not infectious. A common form in California to which the term gummosis is applied occurs on the lemon, although the characteristic trouble is not confined to these trees. An examination of diseased trees showed that the gum does not originate in the bark, but breaks out through the latter by mechanical pressure from within. The affected area may be large or small and may spread until the trunk is completely girdled. In severe cases the bark of the affected portions dies and the tree may do likewise. The relation of soil and location of orchards to this disease is discussed, and it is shown that almost invariably gummosis is found in trees growing in poorly drained situations, such as the lower slopes of orchards, or where the orchard is on heavy soil or poorly drained due to hardpan or other causes. The effect of the disease upon the tissues is described and methods of control are suggested, among them the avoidance of unfavorable conditions in planting, the use of sour-orange roots as stock, high budding, cultural prevention, improvement of soil conditions, slitting and stripping the bark on diseased areas, etc. Where the bark is cut it has been found advantageous to cover the wounds with a form of grafting wax to prevent the entrance of fungi. Attention should be paid to soil improvement and pruning, and it has been found that good drainage and the proper aeration of the roots by boxing or digging away about the trees and placing sand about the trunks are on the whole practical means for the prevention of gummosis.

Another citrus tree disease described is that known as scaly bark, or psorosis, which is primarily a disease of the orange and which apparently rarely occurs on other citrus trees. This disease is distinguished from gummosis by its occurrence at any point on the trunk or branches of a tree, and there is apparently no direct connection between the soil and the location of the affected area. The appearance of the disease is well described by the name scaly bark. The authors say that there seems to be a connection between the irregular water supply and the occurrence of scaly bark, and an extreme case is cited which seems to prove their claim. The relation of scaly bark to gummosis is discussed, and for the control of the former the authors say that treatment does not promise very satisfactory results and that precautions for the prevention of the disease are more to be sought than methods for its treatment. The methods of treatment are essentially the same as those described for gummosis.

Brief notes are also given on the gumming of nursery trees, foot rot, Florida die back or exanthema, and twig blight.

Phoma abietina, a parasitic disease of the fir, E. Mer (*Rev. Eaux et Forêts, 47 (1908), No. 20, pp. 609–621*).—In 1890 the author published an account of a disease of fir trees in which a kind of canker was formed by *P. abietina*. During a recent outbreak of a disease of firs in the Jura Mountains, he was led to

investigate its cause. At first there appeared to be no relation between the 2 diseases, as no Phoma was found in dead material. In a subsequent and more careful study, however, the presence of a fungus was indicated, although in the last instance the disease differed quite markedly from the previous attack.

In the present outbreak the fungus seems to attack the young twigs, causing their destruction within a relatively short time, and the injury to the tree is much more serious than that formerly observed. A number of causes are mentioned as probably contributing to the unusual severity of the fungus attack, among them the prevailing high winds, the severe winter of 1906–7 followed by a prolonged drought in the summer, rocky soil, etc., all of which weakened the trees and made them more liable to attack.

The leaf cast of white pine, K. von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 6, pp. 327–330, figs. 3; abs. in Bot. Centbl., 108 (1908), No. 14, p. 365*).—A description is given of a disease of white pine, due to the fungus *Hypoderma brachysporum*, which causes a falling of the leaves. In addition to white pine, it also occurs on *Pinus excelsa*.

A note on the mildew of oaks, Griffon and Maublanc (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 8, pp. 437–439*).—During the summer of 1908 the oaks in many parts of France are said to have been severely attacked by a white mold of which only the Oïdium phase is known. All the species of deciduous oaks seemed to be subject to this fungus, a few being particularly injured. It has been impossible to definitely determine the species, but a species (*Microsphæra alni*) occurring on the alder has been considered as possibly attacking the oak. Observations, however, showed that while beech trees seem to be subject to the same mildew as the oaks, the alders have escaped even when growing in close proximity to diseased oak trees. It is thought that if the species is the same as that occurring on the alder, possibly it is a specialized form which now occurs only upon the oak.

On account of the difficulty of treating oak trees, no practical means are known for combating the fungus.

Mildew of oaks, Boudier (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 9, pp. 461, 462*).—Attention is called to the abundant occurrence during the past season of a mildew of oaks in many localities of France. While the fruiting form of the mature fungus has not yet been found, attention is called to the fact that a mildew (*Erysiphe quercus*) was found on leaves in the vicinity of Paris and described some 60 years ago. The author thinks that perhaps this species may be the one under consideration.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report on economic zoology for the year ending April 1, 1907, F. V. Theobald (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 29–180, pls. 29, figs. 20*).—An extensive report with biological and economic notes is given of the principal animal pests of the year. These are arranged under the following headings: Animals injurious to man's domesticated animals, fruit trees and bushes, vines, fruit, corn crops, root crops, pulse, hops, vegetables, flowers, forest trees, man's stores; those causing annoyance to man; and general notes. Among the principal attacks were those of a new gooseberry cecidomyia, leaf hoppers, a black currant mite, eelworms, pigmy mangold beetle, and the turnip gall weevil.

The faunal affinities of the prairie region of Central North America, A. G. Ruthven (*Amer. Nat., 42 (1908), No. 498, pp. 388–393, map 1*).—This subject is briefly considered, references to the literature being given.

The commoner birds of our gardens; their habits and foods, C. H. HOOPER (*Jour. Roy. Hort. Soc. [London], 33 (1908), No. 2, pp. 427–450, fig. 1*).—Following an account of their habits and food, the author gives a classification of birds as to food, and discusses their influence upon insects injurious to fruit, their injury to fruit, and methods for modifying the harm done.

The birds of Maine, O. W. KNIGHT (*Bangor, Me., 1908, pp. XVIII+19–693, pls. 26, map 1*).—This work includes "a key to the description of the various species known to have occurred in the State, an account of their distribution and migration, showing their relative abundance in the various counties of the State as well as other regions, and contributions to their life histories." The faunal areas of the State are considered and a bibliographical list, arranged in chronological order, is appended.

Bibliography of Canadian zoology for 1906, J. F. WHITEAVES (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 1 (1907), Sec. IV, pp. 209–218*).—In this list, which does not include entomology, are given the publications of 56 authors.

Bibliography of Canadian entomology for the year 1906, C. J. S. BETHUNE (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 1 (1907), Sec. IV, pp. 131–141*).—This includes 109 titles ascribed to 56 authors.

Uniform common names for insects, A. F. BURGESS (*Jour. Econ. Ent., 1 (1908), No. 3, pp. 209–213*).—A list of the common names of 142 insects which have been accepted by the American Association of Economic Entomologists.

American insects, V. L. KELLOGG (*New York, 1908, pp. XIV+694, pls. 13, figs. 812*).—In this second and revised edition are included 19 chapters and an appendix. The first 3 chapters consider the structure and special physiology, development and metamorphosis, and the classification of insects. Chapters 4–15 are devoted to a description of the insects composing the various orders. Chapters 16–18 take up insects and their relation to flowers, color and pattern and their uses, and insects and disease, and chapter 20 the collecting and rearing of insects. Chapter 19, on reflexes, instincts, and intelligence, is added in this edition. It is stated that the book is written with the endeavor to foster an interest in insect biology on the part of students in natural history, nature observers, and general readers.

Forest entomology, A. T. GILLANDERS (*Edinburgh and London, 1908, pp. XXII+422, figs. 351*).—In the first 10 chapters of this volume on forest insects the nature of their injury, prevention, and remedial measures, with references to the literature consulted, are discussed under the various orders of insects.

In chapter 11 are given hints on collecting, preparing, and mounting, and in chapter 12, insecticides and general remedies. In chapter 13, beneficial insects are discussed. Chapter 14 is devoted to a tabular list of trees injured, with the nature of the injury, and scientific names of the insects causing it.

Proceedings of the twentieth annual meeting of the Association of Economic Entomologists (*Jour. Econ. Ent., 1 (1908), No. 3, pp. 169–209, pls. 2*).—A continuation of the report of the proceedings of this meeting previously noted (E. S. R., 20, pp. 252, 552).

A paper upon The Orange Worm (*Trypeta ludens*), by A. L. Herrera (pp. 169–174), discusses the occurrence of the pest in Mexico, the natural enemies, and artificial means of control. A bibliographical list is also given. H. J. Quayle, in a paper on A New Root Pest of the Vine in California (pp. 175, 176), gave a brief account of *Adoxus obscurus* and *A. vitis* and the injury caused by them, and also discussed The California Life History of the Grape Leaf-hopper (*Typhlocyba comes*) (pp. 182, 183). C. P. Gillette, in a paper entitled *Aphis gossypii* and Its Allies (pp. 176–181), considered the identification of the several species, the influence of the host plant upon aphid characteristics, the possibility of *A. gossypii* and *medicaginis* laying eggs, and food plants. The Life

History of the Striped Cucumber Beetle, with a Brief Account of Some Experiments for its Control, is the title of a paper presented by T. J. Headlee (pp. 203–209), in which an account is given of life history, injury to plants, natural enemies, and methods of combating *Diabrotica vittata*.

Papers are also included by H. A. Gossard on The Catalpa Bud Maggot (*Cecidomyia catalpæ*) (pp. 181, 182), on Notes of the Season (pp. 183–191), and on The Honey and Pollen-yielding Plants of Texas, by A. F. Conradi (pp. 191–203).

Report of the sixth annual meeting of the American Association of Horticultural Inspectors (*Jour. Econ. Ent., 1 (1908), No. 3, pp. 220–224*).—A brief report is given of the meeting held at Chicago, Illinois, December 27, 1907.

Twenty-third report of the State entomologist on injurious and other insects of the State of New York, 1907, E. P. Felt (*N. Y. State Mus. Bul. 124, pp. 541, pls. 44, figs. 49*).—During the year under report a wide departure of the climatic conditions from that of normal years apparently accounted for a remarkable dearth of injurious insect outbreaks. The spread of the San José scale continued and in some instances, where little effort was made to check its ravages, practically the entire fruit crop was ruined. Several shade-tree pests caused considerable devastation.

The green-striped maple worm (*Anisota rubicunda*) was abundant in one county where it stripped the leaves from large blocks of forests. The snow-white linden moth (*Ennomos subsignarius*) was very abundant on beech trees in the Catskills and defoliated these trees over large areas in one locality.

Notes for the year include data on the red-humped apple-tree caterpillar, lesser peach borer, lesser apple worm, apple maggot or railroad worm, San José scale, grape-root worm, white-marked tussock moth, elm-leaf beetle, sugar-maple borer, white grubs, *Epizeuxis denticulalis*, *Archips sorbiana*, birch-leaf bucculatrix, *Leucobrephos brephoides*, and the periodical cicada. *A. sorbiana* was brought into the State in April, 1906, on Japanese maple imported direct from Japan, but these were destroyed and none are supposed to have escaped. Biological and economic notes and bibliographical references are given on *Anisota rubicunda*, *Heterocampa guttiritta*, *Ennomos subsignarius*, and *Ancylus nubeculana*. Lists are given of the publications of the entomologists during the year 1907 and of contributions to the State collection.

Appendix A consists of a list of the William W. Hill collection of lepidoptera embodying 10,000 species which has been added to the State collection. In Appendix B is given a catalogue of the Phytoptid galls of North America by George H. Chadwick. In this list a total of 170 forms are recorded and references to the literature are given. In Appendix C appears a report of the entomological field station conducted at Old Forge, New York, in the summer of 1905, by James G. Needham. This contains information on new methods employed in ecological work, data on the food of fishes, and biological notes on a number of aquatic forms, particularly May flies, dragon flies, and crane flies. A new genus and two new species are described, and a table of classification, the larval habits, and a key to the genera of North American crane flies are included, together with an account of the appendages of the second abdominal segment of male dragon flies by Oliver S. Thompson, and descriptions of new North American Chironomidæ by Oscar A. Johannsen, with bibliographical references by each. In Appendix D are given descriptions of new species of Cecidomyiidæ, a discussion of the Circumfili of the Cecidomyiidæ, and studies with preliminary keys for the recognition of certain Cecidomyiidæ.

Injurious insects, F. García (*New Mexico Sta. Bul. 68, pp. 5–63, figs. 35*).—A general account is given of the more important injurious insects occurring in the State, these being considered under the headings garden insects, insects

injurious to staple crops, and fruit insects. Directions are given for the preparation and application of insecticides with estimates of the probable costs of the materials. A brief account of the spring grain aphis or green bug, by F. M. Webster, and the New Mexico law on orchard inspection are appended.

Entomological notes, W. B. Gurney (*Agr. Gaz. N. S. Wales, 19 (1908), No. 6, pp. 503–507, figs. 3*).—These notes include an account of beetles attacking furniture and woodwork, of pea and bean weevils, and of an aphis causing scab on white-skinned sheep, cattle, and horses. The clover aphis appears to be the cause of the affection here reported. An account is also included of beetles of the species *Xylotrupes gideon* attacking cocoanut palm in the Solomon Islands.

Imported insect pests, H. M. Lefroy (*Agr. Jour. India, 3 (1908), No. 3, pp. 237–244*).—With a view to the adoption of measures for preventing the introduction of insect pests into India, the author here considers the probable origin of those common to that country. He concludes that the evidence derived from this examination is reassuring, that with the few prominent exceptions it points to a natural immunity from undesirable introductions, partly because of the natural isolation of India, but largely on account of its climate. It is stated that the only measures at present taken against such introduction is the fumigation of all American cotton-seed at ports of entry to insure the destruction of the boll weevil.

Report of the entomologist, C. B. Simpson (*Transvaal Dept. Agr. Ann. Rpt. 1904–5, pp. 332–354*).—An account is given of the extensive work carried on against the brown locust (*Pachytylus sulcicollis*), and the purple locust (*Acridium purpuriferum*). Other work is reported under the headings of bee keeping, insects injurious to man, insects injurious to domesticated animals, insects poisonous to animals, forest insects, insects injurious to orchards, insects injurious to field crops, and insects affecting garden crops.

Effects of spraying with arsenical solutions for locust destruction, H. Ingle (*Transvaal Dept. Agr. Ann. Rpt. 1905–6, pp. 190–192*).—In order to determine the danger to cattle, birds, and poultry from eating the grass or locusts poisoned with arsenate of soda and sugar solution as used by the division of entomology, analyses were made. The results show that it is necessary to prevent stock from entering the fields of grass recently sprayed, although the danger of poisoning stock diminishes rapidly after rain has fallen. In regard to the danger to poultry from eating the locusts the author states, "it is evident from the determinations that the amount of arsenic in locusts which have died from arsenical poisoning is not very great, and that unless fowls eat an inordinate number of the insects, the danger of poisoning the poultry is not excessive. At the same time, since fowls are very greedy for locusts, care should be taken to prevent them from gorging themselves with the poisoned insects, or harmful effects may follow."

The codling moth, C. W. Howard (*Transvaal Agr. Jour., 6 (1908), No. 24, pp. 523–526, pl. 1*).—A brief description is given of the pest and its introduction from Cape Colony, which is now overrun. At present, with the exception of one locality in which extermination is being attempted, there is practically no codling moth in the Transvaal. Imported apples and pears which bear evidence of its presence to the extent of 1 per cent are destroyed.

Woolly aphis and tobacco extract, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 33 (1908), No. 2, pp. 188–193, fig. 1*).—This aphis is stated to be the most troublesome apple-tree pest in Cape Colony. The value of tobacco extract is discussed, and notes are given on other remedies and on the life cycle of the insect.

The apple sawfly (Hoplocampa (Tenthredo) testudinea) (*Bd. Agr. and Fisheries [London], Leaflet 205, pp. 2, fig. 1*).—This leaflet gives a description of the pest, the nature of its injury, its life history, and methods of treatment.

The fruit fly parasite, L. J. Newman (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 1, pp. 561–563, pls. 2*).—An undetermined chalcid parasitic upon *Ceratitis capitata* was introduced from India by Compere in December, 1907. During transportation pupæ containing the hibernating parasites were kept on ice for 60 days. The chalcid, which is about $\frac{1}{16}$ in. in length, attacks the maggots from any quarter, depositing eggs in the body of the host. The average number of parasites per fly larva is 15, though as many as 30 have been found. A succession of parasites has been kept going, and 150 colonies of not less than 500 parasites have been liberated, but the results can not be determined until another summer. Life history notes and methods of breeding the parasites are given.

The San José scale in Arkansas, C. F. Adams (*Arkansas Sta. Bul. 102, pp. 221–236, figs. 12*).—This insect is said to be rapidly becoming the most injurious insect of the orchard in Arkansas. The author here considers the life history of the pest, the nature of its injury, and remedies.

Report of the viticultural station and phylloxera service on the work during 1907 (*Phylloxéra. Rap. Stat. Vit. et Serv. Phyllox. [Canton de Vaud], 1907, pp. 60*).—A detailed account is given of experiments made with insecticides in freeing the vines from phylloxera, of the laws and regulations concerning the pest, and of newly discovered infestations.

The European elm scale (Gossyparia spuria), S. B. Doten (*Nevada Sta. Bul. 65, pp. 5–34, pls. 14*).—This pest which has been injuriously abundant in Carson City for some years has more recently appeared in Reno, where many of the residence streets are lined with young elms, killing a large number and greatly injuring hundreds of others. Numerous photographic illustrations and drawings accompany the account of its life history and habits.

Experiments were conducted in which lime-sulphur wash, kerosene emulsion, and scalecide were used. In every instance where lime sulphur was used the author infers that many hibernating larvæ escaped. He considers it best to wash away all visible clusters of dead females from the bark before spraying with this insecticide, in order to destroy the concealed winter larvæ, and suggests that after spraying, in order to destroy the living female scales which escape the action of the insecticide, the trees be washed late in May or early in June with a stream of water under high pressure. Kerosene emulsion containing at least one-sixth kerosene, which is considered as too strong to use even on dormant elms, was required in order to kill the hibernating larvæ. It is inferred that scalecide can be used at a strength as low as 1 : 15 if the application wets the hibernating larvæ completely.

The author states that he has washed the winter larvæ out of cracks and crevices with a strong stream from a garden hose at a distance of 10 ft. from the nozzle. He further states that where such a stream is thoroughly applied, once in April just before the leaves begin to show and once in June before the young scale insects appear, that the trees will be comparatively clean the following winter. As too close growing and poorly pruned trees furnish favorable conditions for the development of this scale, the axe, grubbing hoe, and pruning saw should first be used, followed by the garden hose and, where necessary, the spray pump as a last resort.

Observations on the genus Contarinia, E. P. Felt (*Jour. Econ. Ent., 1 (1908), No. 3, pp. 225–227*).—The author considers briefly the species belonging to the cecidomyid genus Contarinia and the nature of their injury.

Notes on the preparatory stages of some species of Canadian lepidoptera, J. Fletcher and A. Gibson (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 1 (1907), Sec. IV, pp. 57–70*).—Descriptions and biological notes are given on the

immature stages of the species *Mamestra grandis*, *M. adjuncta*, *Xylina disposita*, *Gluphisia severa*, *Petrophora ferrugata*, and *Gonodontis duaria*.

Upon the life cycle of Phylloxera quercus, B. Bonfigli (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), II, No. 5, pp. 248–253*).—In connection with this account the author gives three schemes which graphically illustrate the life cycle.

Notes on Trogoderma tarsale, C. O. Houghton (*Jour. Econ. Ent., 1 (1908), No. 3, pp. 216, 217*).—The author records this species as developing to maturity by subsisting upon dry hickory-nut shells.

Saxon forest pest, C. B. Hurst (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3302, p. 11*).—Caterpillars of the species *Ocneria monacha* are reported as very destructive to forests, particularly conifers, in one district of Saxony. Distribution by railroad trains and destruction by attraction to light and by hand picking of the moths by children are mentioned.

Is it wise to dip nursery stock? F. H. Hall (*New York State Sta. Bul. 302, popular ed., pp. 2–4*).—A popular edition of Bulletin 302 of the station previously noted (E. S. R., 20, p. 256).

Insecticide materials and their application, with suggestions for practice, J. B. Smith (*New Jersey Stas. Bul. 213, pp. 3–46*).—In this account the author discusses spraying machinery, insecticides and their application in orchard practice, particularly as relating to the San José scale, codling moth, and plum curculio.

Analyses of Paris green and lead arsenate, C. S. Cathcart (*New Jersey Stas. Bul. 214, pp. 3–14*).—Analyses are reported of 19 samples representing 17 brands of Paris green bought in the original packages and of 7 samples representing 6 brands bought in bulk. While the weights of the samples, as received in their original packages, with one exception, equaled or exceeded the weights claimed, there was a shortage in the actual weight of Paris green in 9 of the 19 samples ranging from 2.50 to 25 per cent with an average of 9.28 per cent. All of these samples contained not less than 50 per cent of arsenious oxid combined with copper as required by the New Jersey law, except one sample which contained a large proportion of white arsenic. The average composition of the samples analyzed was as follows: Total arsenious oxid, 57.14 per cent; water-soluble arsenic compounds, 1.41 per cent; copper oxid, 29.38 per cent; and arsenious oxid combined with copper, 54.94 per cent.

Analyses of 15 samples of 9 brands of lead arsenate are reported and show the following variation: Moisture, from 25.35 to 56.66 per cent; arsenic oxid, from 4.21 to 20.48 per cent; lead oxid, from 16.07 to 44.32 per cent; water-soluble arsenic, from 0.20 to 0.79 per cent. This large variation is considered as due to some extent to the evaporation of water after leaving the factory.

On six new species of Ixodidæ, including a second species of the new genus Rhipicentor, W. F. Cooper, B. A. Cantab, and L. E. Robinson (*Proc. Cambridge Phil. Soc., 14 (1908), No. 5, pp. 457–470, figs. 24*).—Descriptions and illustrations are given of the six new species *Amblyomma longirostrum*, *A. cœlaturum*, *Rhipicentor nuttalli*, *Aponomma javanense*, *A. simplex*, and *A. quadratum*.

On the habits, life cycle, and breeding places of the common house fly, R. Newstead (*Ann. Trop. Med. and Par., 1 (1908), No. 4, pp. 507–520, pls. 6*).—A report is given of investigations carried on in the city of Liverpool to ascertain the nature and extent of the breeding places of *Musca domestica*, which appears to comprise 90 per cent of the flies there met with in the houses. Examinations were made of various breeding places, an account of which is given. Under the most favorable conditions, the flies develop in from 10 to 14 days. Suggestions as to remedies include the removal in summer

of all refuse litter and excreta at intervals not greater than 7 days, and the application of Paris green (2 oz. to 1 gal. of water) to refuse, excreta, and screenings of stables. Brief notes on 8 other species of flies and 2 species of beetles met with during the investigation accompany the report.

Flies as carriers of contagion in yaws. A. Robertson (*Jour. Trop. Med. and Hyg. [London], 11 (1908), No. 14, p. 213*).—As a result of examinations the author concludes that the house fly is capable of carrying the virus of yaws.

Bee pirates. C. W. Mally (*Agr. Jour. Cape Good Hope, 33 (1908), No. 2, pp. 206–213, figs. 4*).—The terms "bee pirate" and "bee tiger" are used in connection with certain "digger wasps" particularly *Philanthus diadema* and *Palarus latifrons*, which prey upon hive bees. The bees are caught by these pirates and stored in cells in the ground to serve as food for the larvæ when they hatch.

Notes are given on the life history, habits, and natural enemies of the former species, for which no satisfactory remedy has yet been found. Brief notes are given on the latter species, as well as several methods for fighting it.

Some information on silkworm culture in the Philippine Islands. W. Schultze (*Philippine Agr. Rev. [English ed.], 1 (1908), No. 6, pp. 250–253, pl. 1*).—Experiments have been carried on and are still under way with a view to determining the possibility of introducing the industry into the islands. The species *Attacus atlas*, *A. ricini*, and *Antheræa semperi* are found in the islands but, so far as known, there are no cultivated species. Experiments made with *Bombyx mori* and directions for raising silkworms are given. A law prohibiting the importation by private concerns of live silkworms or eggs gives protection against the introduction of diseases, which at present do not exist in the islands.

FOODS—HUMAN NUTRITION.

Report of the State food commissioner of Illinois, 1907. A. H. Jones (*Ann. Rpt. State Food Comr. Ill., 8 (1908), pp. 252, pl. 1*).—This volume contains reports of the various pure food officials and the State food and feeding stuffs laws, tentative food standards, court decisions, and similar data.

Report of State analyst. T. J. Bryan (pp. 33–124).—Details are given of the examination under the State pure food law of a large number of samples of butter and butter substitutes, milk and cream, flavoring extracts, jellies, jams, and preserves, spices, vinegar, maple sugar, and sirup, confectionery, etc., and also of 108 samples of feeding stuffs of which only 8 were legal. "Practically all of the 100 were illegal, through lack of guaranty or because the license fee had not been paid."

Milk and milk products, water, foods, and condiments. C. Aumann (*Ber. Landw. Vers. Stat. Hildesheim, 1907, pp. 14, 15*).—A brief account of the examination at the station of a number of samples of dairy products, water, foods, and condiments.

Food laws in the United States. C. A. Neufeld (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 111–128*).—A discussion of American pure food laws.

Ohio general food and drug law. R. W. Dunlap (*Columbus, O., 1908, pp. 4*).—The text of the Ohio general food and drug law as amended May 1, 1908, is given.

Labels and rulings. E. F. Ladd (*North Dakota Sta. Spec. Bul. 7, pp. 8*).—The author quotes resolutions adopted September 17, 1907, at a convention of pure food officials of the middle Western States which were designed to facilitate and secure uniform enforcement of the various State pure food laws. The resolutions are discussed and explained.

Progress in the chemistry of food and condiments in the year 1907, H. Kuttenkeuler (*Chem. Ztg., 32 (1908), No. 59, pp. 693–695; 60, pp. 709–711; 61, pp. 720, 721*).—A digest of investigations which have been reported during the year.

The effect of certain preservatives on chopped meat, O. Mezger and K. Fuchs (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 12, pp. 715–728*).—Chopped meat to which benzoic acid was added showed a pale color on the surface although the red color of the interior was little changed. Sodium benzoate increased the color of such meat. Alkaline sodium phosphate strengthened the color at first. Commercial preservative salts were also tested.

Lard from oily hogs, W. D. Richardson and F. O. Farey (*Jour. Amer. Chem. Soc., 30 (1908), No. 7, pp. 1191, 1192*).—The authors report determinations of the melting point and other constants of back fat, leaf lard, and ham fat from so-called oily hogs.

Examination of sausages and their hygienic preparation, W. G. Savage (*Jour. Roy. Sanit. Inst., 29 (1908), No. 8, pp. 366–373; Vet. Rec., 21 (1908), No. 1053, pp. 160–162*).—The author investigated the kind and number of bacteria present in sausages with reference to their age and the method of preparing the sausage casings. It is a common practice to pickle sausage casings in salt, the method employed varying under different circumstances. According to the author "the action of sodium chlorid upon bacteria is a very weak one, and brine solutions have to be both fairly concentrated and prolonged in their action to effect the death of pathogenic bacteria."

The occurrence of monaminic acids in meat extract, K. Micko (*Ztschr. Physiol. Chem., 56 (1908), No. 2, pp. 180–211*).—Alanin, glutaminic acid, and taurin were identified in meat extract, the total quantity amounting to 0.51 per cent of the extract or 85 per cent of its ash free dry matter.

A study of the extractive material of fish flesh, A. Suwa (*Zentbl. Physiol., 22 (1908), No. 10, pp. 307–310*).—Creatin was found in quantity in extract prepared from fish flesh but ignotin and histidin in minute quantities only. Methyl guanidin and neurin were also found. The author states that other bases are present and that the work is being continued.

Preparing preserved crabs without boric acid, P. Buttenberg (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 92–109*).—The author regards rapid and cleanly work as absolutely essential to the preparation of these goods without preservatives. Fractional sterilization gave practically sterile goods.

Judging preserved egg yolk, A. Brüning (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 7, pp. 414, 415*).—From a bacteriological study the author concludes that heating to at least 120° C. is essential in the preparation of preserved egg yolk for food purposes.

Note on a sample of preserved egg yolk, A. Schoonjans (*Bul. Soc. Chim. Belg., 22 (1908), No. 3, pp. 119–122*).—Analytical data are reported. The material contained boric acid.

The influence of heat on the lecithin-phosphoric acid content of egg pastes, W. Ludwig (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 11, pp. 668–680*).—The analytical studies reported and discussed have to do with the question of the changes in egg pastes when stored.

Paste goods containing eggs, Witte (*Ztschr. Öffentl. Chem., 14 (1908), No. 17, pp. 326–331*).—Analytical data obtained with noodles, egg noodles and similar goods are reported and discussed with reference to judging this class of food products.

Determining the baking quality of flour, M. Renner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 4, 234–238*).—In a study of Liebermann's

method it was noted that 3 white, finely ground flours yielded gluten with a lower expansion value than coarser flours. This value also diminishes the longer the flour is kept and if the flour becomes acid the decrease is very marked.

Determining the volume of bread, M. P. NEUMANN and P. SALECKER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 5, pp. 285–290, figs. 2*).—According to the authors' investigations better results are obtained with water than with fine seed in determining the volume of a loaf by displacement. When water is used the bread must be first coated with paraffin. The apparatus which they use is described.

Experiments with special bread made from the entire grain, H. STRUNK (*Veröffentl. Mil. Sanitätsw., 1908, No. 38, pp. 35–52; abs. in Chem. Zentbl., 1908, I, No. 20, p. 1848*).—Digestion experiments and other studies showed that the nitrogenous material in this bread was not more thoroughly assimilated than in ordinary army bread. On the other hand, the assimilation of mineral matter, especially phosphoric acid, was increased. The bread under consideration was made by a special process in which the bran is separated, treated in such a way as to soften it, and then mixed with the flour in bread making.

Concerning bread facilities, H. BISCHOFF (*Ztschr. Hyg. u. Infektionskrank., 59 (1908), pp. 154–160; abs. in Chem. Zentbl., 1908, I, No. 26, p. 2197*).—The author concludes that army bread should be made from flour with a low bran content.

Helianthus tubers, a new vegetable, L. KROEBER (*Apoth. Ztg., 23 (1908), No. 430; abs. in Chem. Ztg., 32 (1908), No. 54, Repert., p. 353*).—A brief note on the culture and use of helianthus tubers as a vegetable. They resemble potatoes in the method in which they are used and suggest artichokes in flavor.

A sample of Chinese soy, A. HERLANT (*Bul. Soc. Roy. Sci. Méd. et Nat. Bruxelles, 66 (1908), p. 35; abs. in Biochem. Zentbl., 7 (1908), No. 11–12, p. 481*).—Soy is described and an analysis of a Chinese sample is reported.

Chemical study of a sugar yielding grass, E. PERROT and E. TASSILLY (*Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 12, pp. 740–742; abs. in Chem. Abs., 2 (1908), No. 22, pp. 3113, 3114*).—Analyses showed that *Panicum stagninum* contained 10 per cent cane sugar, 7 per cent dextrose, and emulsin. No glucosids or invertase were identified. This plant grows in the marshy regions about the Niger and is used in making a sort of sirup and other food products or drinks.

The endo- and ektoinvertase of the date, A. E. VINSON (*Jour. Amer. Chem. Soc., 30 (1908), No. 6, pp. 1005–1020*).—The following is quoted from the author's summary of his work and discussion of problems concerned with the ripening of dates:

"The invertase of the date remains insoluble in all ordinary solvents throughout its green stages, but becomes readily soluble on ripening. The change in the behavior of the invertase toward solvents coincides very closely in point of time with the passage of the tannin into the insoluble form. Tannin in relatively large amounts does not retard the action of date invertase either in the extract or in the pulp. Soluble tannin, however, hinders the solution of date invertase in water, but the invertase can be extracted by glycerol, provided the glycerol is added at the same time the tannin is added. Green date invertase can not be extracted by crushing and macerating the green fruit with glycerol, therefore the invertase is not rendered insoluble by the escape of soluble tannin on crushing the tannin cells. This conclusion is confirmed by the behavior of the invertase in the tannin-free portion of the date after the tannin-bearing tissues have been completely removed. There is no direct connection between the change in the state of the tannin and that of the invertase.

"The inversion of cane sugar by the green date pulp is not accomplished by the living protoplasm liberating a soluble ferment from a pre-existing insoluble zymogen or by rendering active a pro-ferment. The rate of inversion by equivalent amounts of green and ripe pulp of the same variety are practical identical. Protoplasmic poisons—picric acid, chromic acid, and formaldehyde—retard the action of green and ripe pulp but to approximately the same degree. If the living protoplasm were in any way connected with the inversion, the retardation would be greatly intensified in the case of green date. Green date tissue is not rendered inactive by soaking in ether, chloroform, acetone, etc."

Sulphurous acid content of California dried fruit, S. A. Prstibytek (*Chem. Ztg., 32 (1908), No. 61, Repert., p. 394*).—Of the 50 samples examined 40 contained on an average 75.4 mg. sulphurous acid per 100 gm. Plums, apricots, and dates were found to contain no sulphurous acid, and 1 sample of apples and 1 of raisins contained only very little.

Composition of some fruit juices and alcohol fruit extracts used for making bonbons, sirups, liqueurs, etc., Chauvin, Joulin, and Canu (*Monit. Sci., 4. scr., 22 (1908), II, p. 449; abs. in Chem. Ztg., 32 (1908), No. 67, Repert., pp. 426, 427*).—A number of analyses are reported and discussed.

J. Halmi's study of Hungarian fruit juices, W. Plahl (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 7, pp. 416, 417*).—A polemical discussion of work previously noted (E. S. R., 20, p. 263).

Examination of currant juice, Elisabeth Van West (*Chem. Weekbl., 5 (1908), No. 13, pp. 216–221, dgm. 1; Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 10, pp. 595–598, dgm. 1*).—The amount of dry matter in currant juice and its relation to specific gravity and other characteristics were studied with a view to judging quality. In the author's opinion, determining the specific gravity furnishes a fairly accurate means of judging quality for commercial purposes.

Examination of lemon juice, G. Devin (*Veröffentl. Mil. Sanitätsw., 1908, No. 38, pp. 1–7; abs. in Chem. Zentbl., 1908, I, No. 20, pp. 1848, 1849*).—The keeping quality of lemon juice was studied with commercial samples and material prepared by the author, his conclusion being that pasteurized lemon juice will keep well and that the addition of alcohol is not essential. Chemical preservatives should be excluded.

The declaration of marmalades, fruit juices, and other fruit products, A. Beythien (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 77–86*).—The author reports and discusses the recommendations of the Society of German Food Chemists.

Marmalades, F. Härtel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 86–92*).—A discussion on the manufacture and declaration of marmalades.

The occurrence of arsenic in marmalades, G. Rupp (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 40–43*).—Minute suggestions of arsenic were found in a number of samples of marmalade. The arsenic was accidentally present and due to the use of sirup made by inverting starch.

The effect of color on the composition of cider during fermentation, A. Andouard (*Bul. Sta. Agron. Loire-Inf., 1906–7, pp. 62–64*).—The effect of colored light on cider fermentation was studied with reference to the question of colored glass containers for cider. Green, yellow, red, and violet light did not materially modify the composition of the cider. With blue glass the alcohol, peptin, sugar, tannin, and dry matter were notably diminished, while the volatile acid and total acid were in a measure correspondingly increased. Cider kept in uncolored glass was intermediate in composition.

Extract material of cider, A. Andouard (*Bul. Sta. Agron. Loire-Inf., 1906–7, pp. 32–37*).—The results of a number of analyses are reported.

Quality and composition of Charente wine, J. M. Guillon (*Rev. Vit., 29 (1908), Nos. 733, pp. 6–8; 734, pp. 37–41; 736, pp. 92–94; 737, pp. 129, 130*).—Analytical data are reported and discussed.

White wine which has been decolorized, R. Orlianges (*Rev. Vit., 29 (1908), Nos. 736, pp. 99–101; 737, pp. 124–129*).—Analyses of wine decolorized by different processes are reported in comparison with red wine and legal enactments regarding such wines discussed.

Citric acid and natural wines, H. Astruc (*Ann. Chim. Analyt., 13 (1908), pp. 224–226; abs. in Chem. Zentbl., 1908, II, No. 5, p. 432*).—Investigations led the author to conclude that citric acid, like tartaric acid, is to be regarded as a normal constituent of wine.

Caffein-free coffee, K. Scheringa (*Pharm. Weekbl., 45 (1908), pp. 773, 774; abs. in Chem. Zentbl., 1908, II, No. 4, p. 341*).—Analyses of commercial so-called caffein-free coffee prepared in Bremen showed that it was not caffein free though it contained only about one-twentieth as much as ordinary coffee. The fat content was, on the other hand, much higher than usual.

Caffein-free coffee, K. Lendrich and R. Murdfield (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 12, pp. 705–715*).—The so-called caffein-free coffee examined contained about one-sixth as much of this constituent as natural coffees and showed a lower amount of water soluble material.

Hibiscus seeds as coffee adulterant, A. R. Chiappella (*Bul. Soc. Bot. Ital., 1905, No. 9, pp. 264–276, figs. 2; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 7, p. 424*).—An illustrated description of these hibiscus seeds and their structure with a view to their detection by microscopical methods when used as an adulterant of coffee.

Examination of teas on sale in Turkestan, Karpow (*Ztschr. Angew. Chem., 21 (1908), pp. 1319–1321; abs. in Chem. Ztg., 32 (1908), No. 55, Repert., p. 359*).—Analyses are reported. The thein content was noticeably low.

The composition of Horlick's malted milk, G. F. Richmond and W. E. Musgrave (*Philippine Jour. Sci., 3 (1909), No. 2, pp. 87–90*).—A detailed analysis is reported. The work was undertaken especially to study fat content. Extraction with petroleum ether gave 8.18 per cent fat.

Medicinal foods (*Jour. Amer. Med. Assoc., 48 (1907), pp. 1612–1614, 1694; 49 (1908), pp. 1294, 1295; abs. in Chem. Abs., 2 (1908), No. 12, pp. 1740, 1741*).—Analyses of 18 samples of so-called predigested foods such as peptonoids, peptones, etc., and of a sample of cow's milk are reported. The average energy value of these goods, including the alcohol in them, was 802.4 calories per 500 gm. and their value is accordingly regarded as limited.

Book of recipes (the auto-cook) (*Grand Rapids, Mich., 1908, pp. 156, fig. 1*).—A collection of recipes for cooking meat, vegetables, puddings, etc., by means of a fireless cooker. In many cases the use of heated soapstone plates is recommended as a source of heat in the cooker, particularly as a means of baking.

Cheap food (*Brit. Med. Jour., 1908, No. 2463, pp. 639, 640*).—A discussion of municipal kitchens, workingmen's restaurants, and similar institutions in Europe, which are designed to supply food of good quality at low cost.

The relation of nutrition investigations to questions of home economics, C. F. Langworthy (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 355–368*).—The results of the nutrition investigations of this Office which bear particularly upon home management problems are discussed, especially with reference to variety in the diet and ways of obtaining it, the preparation of food in the home,

food and its preparation in relation to hygiene, home conveniences and related problems, educational work in connection with home economics, and similar questions. Attention is also directed to the fact that this Office has for a long time systematized the collection and dissemination of information regarding the general subject of nutrition.

The physiology of digestion and nutrition, O. COHNHEIM (*Die Physiologie der Verdauung und Ernährung. Berlin and Vienna; rev. in Brit. Med. Jour., 1908, No. 2489, pp. 746, 747.*—A text-book based on the author's lectures in which nutrition, digestion and related questions are discussed on the basis of the results of recent investigations.

Food problems, M. RUBNER (*Volksernährungsfragen. Leipsic, 1908, pp. 144; rev. in Zentbl. Physiol., 22 (1908), No. 11, pp. 349–351*).—The questions especially discussed are protein minimum and the economic effects of the diet of the poor. The author points out the distinction between the physiological and the practical protein minimum and gives reasons for his belief in the desirability of a reasonably generous protein standard.

Appetite from a theoretical and practical standpoint, W. STERNBERG (*Zentbl. Physiol., 22 (1908), No. 11, pp. 329–335*).—From a discussion of various questions concerned with taking food and fasting in man and animals the author concludes that appetite can not be explained simply on the basis of secretion of digestive juices nor can aversion to food be explained solely by the lack of such secretion. He believes that appetite is to be regarded as muscular motion or a manifestation of it.

Concerning work of digestion, E. HEILNER (*Ztschr. Biol., 50 (1908), No. 4, pp. 488–503*).—On the basis of experimental evidence, the author concludes that the term "work of digestion," which has been proposed, is not satisfactory and that "specific dynamic effect of nutrients" is preferable.

The rôle of digestive juices in metabolism as shown by data obtained by the polyfistula method, E. S. LONDON (*Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 3 (1908), No. 14, pp. 529–531*).—A discussion based on the author's experiments in which he points out that digestive juices are to a large extent resorbed and hence should be taken into consideration in discussions of metabolism.

Metabolism experiments on the protein requirement of the child, H. LUNGWITZ (*Stoffwechselversuche weber den Eiweissbedarf des Kindes. Berlin and Halle, 1908, pp. 82; rev. in Brit. Med. Jour., 1908, No. 2489, p. 747*).—In the experimental dietaries protein supplied about 17 per cent of the total energy and about one-half of the protein was of vegetable origin. With less protein the children lost weight while more was found to be wasteful and often harmful.

Diminished muscular activity and protein metabolism, P. A. SHAFFER (*Amer. Jour. Physiol., 22 (1908), No. 4, pp. 445–455*).—The experiments reported were made with healthy men and according to the author support the belief that "with sufficient food either an increase or a decrease of muscular activity within physiological limits has per se no effect upon the protein metabolism as indicated by the nitrogen and sulphur partitions in the urine. We can not, of course, believe that a long-continued diminished activity would not cause a change in the composition of the urine, because the intensity of metabolic processes in a muscle atrophied from disuse is certainly less than in a healthy muscle; but such a change in the composition of the urine should be considered not the direct result of decreased activity, but the result of a pathological condition, which, it may be, was brought about by a diminished activity. Exercise is necessary for health, but the amount of muscular energy expended in a given day (provided the amount is not excessive for the particu-

lar subject) does not appear to affect any of the nitrogenous substances of the urine excreted on that or following days."

Concerning the extractives of muscle. X, The identity of novains with carnitin. R. Krimberg (*Ztschr. Physiol. Chem., 55 (1908), No. 6, pp. 466–480*).—A continuation of the study of meat extractives (E. S. R., 20, p. 365).

Concerning the extractive material of muscle. The relation of oblitin to carnitin. R. Krimberg (*Ztschr. Physiol. Chem., 56 (1908), No. 4, pp. 417–424*).—According to the author's investigations oblitin is readily formed from carnitin. This is taken into account in a critical discussion of the chemistry of meat extract.

Experiments on the effect of a maize diet. Some properties of zein. S. Baglioni (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), I, No. 9, pp. 609–617*).—From experiments with small animals and laboratory data, the conclusion is reached that maize as the sole food for a long time is harmful, probably owing to some specific action of zein.

Concerning the digestion of fat in the animal body. S. Levites (*Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, u. ser., 3 (1908), No. 10, pp. 370–372*).—Using dogs with fistulæ the author studied the digestibility of fatty acids and their salts and found that the salts were better assimilated. In the case of palmitin and oleic acid, however, the differences were not very decided, but with stearic acid, which has a high melting point, the difference was so great as to indicate that this acid can only be assimilated in the intestine as a salt.

The action of gastric juice on starches. H. Roger and L. G. Simon (*Presse Méd. [Paris], 1907, No. 87, pp. 697, 698; abs. in Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, u. ser., 3 (1908), No. 9, pp. 353, 354*).—Gastric juice, the authors state, affects starch solutions in such a way that the action of pancreatin is intensified. This is due to the swelling of the starch grains and to chemical changes in which starch is converted into dextrin. When starch solution is treated with gastric juice and the starch precipitated with alcohol, the filtrate on the addition of iodin shows a red-violet color while a control sample under similar conditions remains colorless. Ptyalin also intensifies the action of pancreatin in the intestinal tract.

Experiments on carbohydrate metabolism. J. E. Johansson (*Skand. Arch. Physiol., 21 (1908), No. 1, pp. 1–34*).—As shown by the respiratory quotient experiments reported, sugar under ordinary dietary conditions causes a decided increase in the production of carbon dioxid which within limits is proportional to the amount of sugar taken. The maximum increase was noted with about 150 gm. of sugar. Levulose increased carbon dioxid production about twice as much as a like amount of dextrose. If the stored glycogen is low the increased carbon dioxid production is less than under normal conditions and sometimes is not evident. The increased carbon dioxid output is difficult to explain on the basis of increased labor of digestion.

With subjects in health neither dextrose or levulose were excreted in the urine except during the period of increased carbon dioxid output. On the other hand, cane sugar was excreted also after this increased output had subsided. The maximum absorption of sugar in the intestine, according to the author, is not over 80 gm. per hour. The maximum carbon dioxid output for cane sugar and levulose was about 35 gm. per hour with a lower value for dextrose and milk sugar.

With diabetic patients the normal increase in carbon dioxid output was noted in some cases while in other cases it was less than normal or absent.

The influence of mineral matter in the formation of the tissues. J. Gautier (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 5, pp. 894–908*).—A discussion of the relations of mineral and organic matter, based on investigations of the

author and others, from which he concludes that mineral matter, in the form of calcium, magnesium, potassium, and sodium, is indispensable to the life of both the cell and the tissues, and that magnesium, by the reduction of CO_2 from the air is the means by which nutrients enter into both plant and animal life.

The action of chocolate and coffee on renal excretion, P. FAUVEL (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 17, pp. 854–856, dgm. 1*).—In the experiments reported it was found that both chocolate and coffee increased markedly the purins in the urine but notably diminished uric acid without at the same time causing a retention of this acid in the body.

On the duration of rest after eating, HALLOPEAU (*Rev. Soc. Sci. Hyg. Aliment., 3 (1906), No. 5, pp. 917–919*).—The author favors, for mental workers, a rest of short duration after the midday meal and an extended rest after the evening meal.

ANIMAL PRODUCTION.

Digestion experiments with the native hay of the Truckee meadows, S. C. DINSMORE and P. B. KENNEDY (*Nevada Sta. Bul. 64, pp. 5–23, pl. 1*).—Five feeding trials of hay from native grasses and sweet clovers of the Truckee meadows and lasting 14 days each were made with two 3-year old sheep. The second growth hay of the first experiment consisted principally of spike rush (*Elcocharis arenicola*), Nebraska sedge (*Carex nebraskensis*), brown-top sedge (*C. athrostachya*), and native clover (*Trifolium spinulosum*). About half of the clover sample in experiment 2 consisted of *T. hybridum* and *T. spinulosum*, the remainder being composed of several varieties of native grasses and sedges. The bulk of the hay in sample 3 consisted of Buckley blue grass (*Poa buckleyana*), alkali meadow grass (*Puccinellia airoides*), and spike rush. The hay of experiment 4 was largely timothy and tickle grass (*Hordeum jubatum*). Common wire grass (*Juncus balticus*) and brown-top sedge composed about one-half of sample 5, the other species present, but in small quantities, being common blue grass (*Poa pratensis*), white-top (*Agrostis exarata*), small-leafed red-top (*A. microphylla*), slough grass (*Beckmannia erucæformis*), and salt grass (*Distichlis spicata*).

The following table shows the average coefficients of digestibility of the different samples:

Average coefficients of digestibility of Nevada native grasses—Experiments with sheep.

Experiment No.—	Sample.	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1	Second growth hay	75.66	71.19	79.12	77.39	77.91	62.58
2	Clover	65.78	52.07	61.69	70.91	66.37	44.11
3	Native blue grass	64.41	46.79	69.27	68.35	65.86	44.52
4	Timothy	74.16	63.85	72.13	78.16	74.08	58.71
5	Wire grass	65.57	51.17	70.71	61.34	75.98	48.39
Average all experiments		69.11	57.01	70.58	71.22	72.04	51.72

"The native hay of the Truckee meadows has proved, so far as can be determined by digestion experiments, to be an excellent forage for fattening stock. It could perhaps be more economically fed if a fodder containing more protein (e. g., alfalfa) were fed along with it. . . .

"The second growth crop was superior to any of the samples, as it most nearly approximated a standard ration for fattening stock."

Feeding for meat production. H. P. ARMSBY (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 108, pp. 89, fig. 1*).—This is a general discussion of principles underlying feeding for meat production. Recent investigations on the laws of growth and the process of fattening are reviewed, with special reference to the choice of animals for meat production, feed requirements, and practical management.

Two physiological processes are involved in commercial meat production, namely, growth and fattening. Growth is largely synonymous with increase of protein tissue, and the rapidly growing cells demand a liberal supply of protein. The average rate of growth diminishes from birth onward. Fattening is the accumulation of adipose tissue with its prime object the improvement in the quality of the lean meat.

"The amount of protein gained is largely dependent upon the age and to a less degree upon the individuality of the animal, although probably affected to some extent by the supply of feed protein. The fat formation, on the other hand, is primarily dependent, in a broad way at least, upon the total feed supply. Accordingly, we should anticipate that the composition of the increase would vary with the age of the animal.

"A deficient protein supply may, of course, limit growth for lack of material, while the same appears to be true of the ash supply. On the other hand, while there are some indications that an abundant protein supply may stimulate slightly the process of growth and lead to its early completion, the effect seems to be at best slight, and it remains true that the production of protein tissue is substantially a function of the animal and not of the food, and that improvement in this respect is a problem for the breeder rather than for the feeder.

"Fattening, on the contrary, is a process which in a given animal at least is largely under the control of the feeder. . . . Fattening may take place at any age, although the greater demand for material for growth in the young animal tends to reduce the proportion of the food available for fattening."

It is believed that the minimum protein supply can not be formulated with exactness, yet "there must be a sufficiency to replace the amounts katabolized in the vital processes and to supply material for new growth. The animal must also receive an amount of potential energy in an available form sufficient to maintain the normal activities of the body and to leave a surplus for storage in the form of flesh and fat." It is pointed out that many animals have been fattened on Indian corn rations, with a ratio of 1 : 10, but that possibly cheaper meat might have been produced had more protein been supplied, although satisfactory results have been reached on rations containing scarcely half the protein called for by the Wolff standard. With any given type of animal the age at which it will reach marketable form and size is fixed by its individuality.

The author does not attempt to formulate numerically the total feed requirements of growing animals, but "is inclined to question whether such standards, however accurate they may be made and however great their statistical value, can ever play any large part in practical feeding operations." In growing animals an important element is considered to be the fact that moderate exercise tends to stimulate the growth of the muscular system.

The relation of steer feeding to farm economics. F. C. QUEREAU (*Tennessee Sta. Bul. 79, pp. 3–26, figs. 12, charts 3*).—This bulletin contains a report of steer-feeding experiments with corn, soy beans, and cowpeas. In 1906–7 an acre of corn lasted 4 steers for 54 days and produced a gain of 129 lbs. The soy-bean acre lasted a similar lot of steers 80 days and produced a gain of 406 lbs., and the cowpea acre lasted 54 days, producing a gain of 289 lbs. In 1907–8 the gains for corresponding lots of steers were for the corn lot 203 lbs., the soy bean lot 541 lbs., and the cowpea lot 327 lbs.

"The yields per acre for the 2 years were approximately the same, viz, 34 bu. of corn and 3,544 lbs. of stover, 20 bu. of soy beans and 2,905 lbs. of straw, 13 bu. of cowpeas and 1,365 lbs. of straw." The increased gains in weight in 1907–8 over those of the previous year is accounted for by the fact that the steers were of a little better quality than those of 1906–7. The cost of growing the corn was $14.86 per acre, the soy beans $13.09 per acre, and the cowpeas $14.51 per acre. Thus, though the three crops cost about the same per acre they gave widely different results when fed. The financial statement is given in full as illustrative of the advantage of growing and feeding legumes to steers from the standpoint of maintaining the fertility of the farm, which is further discussed.

Steer-feeding experiments, J. C. Burns (*Texas Sta. Bul. 110, pp. 3–23, figs. 5*).—A continuation of previous work (E. S. R., 19, p. 674), but with longer feeding periods.

There were two sets of feeding experiments. In the first, Kafir corn, milo maize, and molasses were compared with Indian corn for fattening cattle. In the second, cotton seed was compared with cotton-seed meal as a supplement to Kafir corn. Thirty 2-year-old Aberdeen-Angus steers were divided into 5 lots and fed for 120 days. The first 4 lots were fed an average daily ration per head of 3 lbs. cotton-seed meal and 12 lbs. hulls. In addition lot 1 received 17 lbs. Indian corn; lot 2, 17 lbs. Kafir corn; lot 3, 17 lbs. milo maize; and lot 4, 8 lbs. molasses and 9 lbs. Indian corn. The ration of lot 5 was 17 lbs. Kafir corn, 4 lbs. cotton seed, 1 lb. cotton-seed meal, and 12 lbs. hulls.

Lot 1 made an average daily gain per head of 2.1 lbs., at a cost of 13.7 cts. per pound. Lot 2 gained 2.47 lbs., at a cost of 10.5 cts. Lot 3 gained 2.12 lbs., at a cost of 12.3 cts. Lot 4 gained 2.26 lbs., at a cost of 11.1 cts. Lot 5 could be contrasted with lot 2 for only 90 days, for which lot 2 made an average daily gain per head of 2.51 lbs., at a cost of 10.7 cts. per pound, and lot 5 gained 2.04 lbs. at a cost of 13.7 cts. per pound. In the slaughter test the results were quite uniform for all the lots, varying only from 60.5 to 61.9 per cent dressed weight.

The following conclusions were drawn:

"Kafir corn was cheaper than Indian corn and yielded better gains.

"Milo maize was cheaper than Indian corn and yielded slightly better gains.

"Molasses very profitably replaced nearly half the Indian corn in a mixed ration of molasses, Indian corn, cotton-seed meal and hulls.

"Cotton-seed meal at $26 per ton was much more profitable than cotton seed at $12 per ton in supplementing a Kafir corn ration with cotton-seed hulls as roughage."

Preliminary report on grazing experiments in a coyote-proof pasture, J. T. Jardine and F. V. Coville (*U. S. Dept. Agr., Forest Serv. Circ. 156, pp. 32, figs. 2*).—This circular reports experiments of the Forest Service, in cooperation with the Bureau of Plant Industry, to devise methods of increasing the forage value of the grazing lands included in the National Forests. At present a large amount of forage is destroyed by herding and trampling.

To test the action of sheep when protected from marauding animals, a pasture of 2,560 acres in the Wallowa National Forest, Oregon, was surrounded with a coyote and wolf-proof fence at a cost of $6,764.31. The fence consisted of a closely barbed hog wire laid along the surface of the ground, a 36-inch strip of woven wire 3 in. above it, a light barbed wire 6 in. above the woven wire, and at the top, 8 in. above the last, a heavy twisted wire without barbs. Animals of prey in the pasture were either killed or driven out. So far the fence has proved to be coyote proof. Grizzly bears managed to get through the fence, though black and brown bears made unsuccessful attempts. Badgers

could dig under the fence and probably cats can climb over or through it. Changes are suggested for similar fences.

A study of the action of sheep is summarized as follows: "When entirely protected from destructive animals a band of dry sheep will separate into bunches, perhaps come together again, and again separate while grazing; they will graze much more openly and do much less trailing than when they are herded; they may travel as far or farther in one day than when herded, but the movement is much less injurious to the forage crop, because they pass over an area only once and are then scattered so that only one animal strikes a plant, whereas when herded they may pass backward and forward over an area many times, and perhaps as many as 50 sheep may strike one plant; their natural tendency is to bed at night in bands, but in smaller bands than when herded; and they much prefer a bed ground that has often been used to one that is entirely new."

[Experiments with lambs and swine], G. H. True (*Nevada Sta. Bul. 63, pp. 27–29*).—Crosses of the Dorset and Merino were made in order to furnish lambs for the Easter market at San Francisco. Lambs born in the winter of 1905–6 made a satisfactory gain of over 4 lbs. per week. The ewes were fed alfalfa hay, chopped roots, barley, and bran. The lambs also received some grain. The first shipment was sold for 20 cts. per pound dressed weight. The remainder brought 35 cts. per pound on board cars at Reno.

In 1905, 4 Tamworth sows and a boar were purchased to conduct an experiment in bacon production. Twenty pigs were born and were kept with the sows in an alfalfa pasture. There being no shade the pigs were seriously affected by sunburn and some of them died. The ears of the old sows were also affected. The author thinks that in a region of bright sunshine black pigment in the skin is necessary for protection.

Pig-feeding experiments, F. B. Linfield (*Montana Sta. Bul. 73, pp. 43–59*).—A study of supplementary feeds in economic fattening of hogs, which is a continuation of previous work (E. S. R., 18, p. 71).

The first experiment was undertaken with 16 grade Berkshires, 5 months old, divided into 4 lots and fed for 50 days, to compare the effect of adding skim milk, alfalfa, and sugar beets to a grain ration. The average daily gains per head were for the lot fed grain alone 1.1 lbs., at a cost of 4.50 cts. per pound; for the lot receiving the grain and skim milk ration 1:3, 1.9 lbs., at a cost of 3.76 cts. per pound; on the grain and alfalfa ration 1.26 lbs., at a cost of 4.15 cts. per pound; and on the grain and sugar-beet ration 1.63 lbs., at a cost of 3.61 cts. per pound.

To compare varying amounts of skim milk 3 lots, with 5 young hogs in each lot, were fed for 1 month rations of grain and skim milk 1:5, 1:3, and 1:1. The average daily gains per head were respectively 1.1 lbs, 1.2 lbs., and 1.4 lbs., at a cost respectively of 3.36 cts., 3.68 cts., and 3.4 cts. per pound. The same hogs, with one additional, were also divided into 4 lots and fed for 65 days to compare peas and barley, and to determine the value of roots and clover when fed with grain. The average daily gains per head were, on the ration of peas and oats 3:1, 1 lb., at a cost of 7.68 cts. per pound; on barley and oats 3:1, 1.03 lbs., at a cost of 5.74 cts.; on barley and oats 3:1, and sugar beets, 0.84 lb., at a cost of 5.71 cts.; and on barley and oats 3:1 and clover, 0.83 lb., at a cost of 6.19 cts. per pound. One lb. of sugar beets was fed to 3 lbs. of grain and 1 lb. of clover was fed to 5 lbs. of grain.

Experiment 4, which included 12 hogs divided into 4 lots and lasted 80 days, was made to compare supplementary foods with barley and oats fed in the ratio of 4:1 as a basal ration. On the barley and oats alone the daily gains per head averaged 1.3 lbs., at a cost of 3.65 cts. per pound; on the grain and skim

milk, 1:3, 1.7 lbs., at a cost of 3.64 cts.; on the grain and clover or grass ad libitum, 1.38 lbs., at a cost of 4.05 cts.; and on the grain and tankage 8:1, 1.55 lbs., at a cost of 4.51 cts. per pound.

In the fifth experiment 9 pigs were divided into 3 lots and fed for 72 days to compare a full grain ration of barley and oats 4:1 in pens and on pasture with a one-half grain ration and pasture. On the full ration and pasture the average daily gain per head was 1.37 lbs., at a cost of 4.24 cts. per pound; on the half ration and pasture, 1.03 lbs., at a cost of 2.82 cts.; and with the full ration in pens, 1.57 lbs., at a cost of 3.96 cts. per pound.

In experiment 6, 9 Poland-China pigs, 10 to 12 weeks old and averaging about 40 lbs. each, were fed for 28 days on a mixed grain ration consisting of 2 parts peas, 2 parts barley, 1 part oats, and 3 lbs. of skim milk to 1 lb. grain. The average daily gain was 0.92 lb. per day, at a cost of 3.62 cts. per pound. In the next experiment the same pigs were fed for 44 days a basal ration of barley and oats 4:1. Lot 1 received sugar beets in addition and made a daily average gain per head of 1.1 lbs., at a cost of 3.86 cts. per pound. Lot 2, fed the grain and skim milk 2:1, made corresponding gain of 1.69 lbs. at a cost of 4.2 cts. per pound. Lot 3, fed the grain and tankage 8:1, gained 1.3 lbs. at a cost of 4.65 cts. per pound.

In experiment 8 there were 4 lots of 3 pigs each and fed for 65 days. Lot 1, receiving equal parts of barley, wheat, and oats made a daily average gain per head of 1.3 lbs., at a cost of 5.02 cts. per pound. Lot 2, fed the grain and skim milk 1:3, gained 2.1 lbs., at a cost of 4.62 cts. per pound. Lot 3, fed the grain and sugar beets ab libitum, gained 1.83 lbs. at a cost of 4.45 cts. per pound. Lot 4, fed grain and clover hay ab libitum, gained 1.7 lbs. at a cost of 4.58 cts. per pound.

A summary of results of these and the previous experiments is given. "For conditions in Montana the value of the supplemental food is: First, skim milk; second, roots; third, tankage; fourth, pasture; fifth, clover and alfalfa. . . . Peas make a more efficient hog feed than does barley, but because of the greater cost of the peas the barley makes a more economical ration."

Some poultry experiments, T. I. MAIRS (*Pennsylvania Sta. Bul. 87, pp. 3–48, figs. 13*).—In the poultry experiments of 1906 the points under observation were rate of growth, food consumed, weight at different ages, relative weight of pullets and cockerels, and the loss in dressing and drawing. The chicks were fed corn and wheat in equal parts and a mash consisting of 50 lbs. corn meal, 25 lbs. wheat bran, 15 lbs. gluten feed, 5 lbs. oil meal, 7½ lbs. alfalfa meal, and 13 lbs. animal meal.

Feed required per pound of gain and average weight at different ages.

Lot.	Breed.	Time hatched.	Number of chicks.	Feed per pound gain 6-13 weeks of age.	Feed per pound gain 13-26 weeks of age.	Average weight.		
						6 weeks.	3 months.	6 months.
				Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	White Wyandottes	Mar. 24	46	3.99	5.37	0.45	1.84	5.33
2	Do	Apr. 21	53	4.21	4.73	.25	1.07	3.90
3	White Leghorns	Apr. 28 / May 4	57	4.87	5.89	.37	1.14	3.42
4	Do	May 13	39	4.76	5.86	.30	1.01	3.20
5	Light Brahmas	Apr. 28 / May 13	26	4.64	5.42	.46	1.43	4.52
6	White Wyandottes	May 13	37	.....	.....	[a].54	1.01	5.22

[a] 8 weeks old.

The Brahmas were not uniform in size, but the Wyandottes were. At 28 weeks of age the pullets in lot 1 averaged 5.04 lbs. in weight and the cockerels 6.24 lbs. At 26 weeks the pullets in lots 3 and 4 weighed 2.89 lbs. and the cockerels 3.64 lbs. At the same age the pullets and cockerels in lot 5 weighed 4.19 and 5.07 lbs., respectively. In a slaughter test the White Wyandottes dressed better than the other breeds, the pullets averaging 65.45 per cent of live weight and the cockerels 60.99 per cent.

The experiments in 1907 were made to determine the comparative growth of different breeds of chickens when given the same food, the comparative value of wet and dry mash, and the relative merits of the various breeds experimented with as to ease of fattening and fitting for market. The results are deemed indicative rather than conclusive, since they show tendencies rather than absolute characters.

Lots 2, 3, 4, and 5, consisting respectively of 56 White Leghorns, 12 White Brahmas and 14 Buff Cochins, 28 Barred Plymouth Rocks and 13 Rhode Island Reds, and 34 White Wyandottes, were fed a mash of ground wheat, corn meal, millet seed, oats, barley, buckwheat, and Kafir corn, and made an average gain of 2.42 lbs. in 14 weeks. Lot 1, consisting of 40 White Leghorns, and lot 6, consisting of 10 Rhode Island Reds and 36 Barred Plymouth Rocks, received the same feeds but in dry form and gained 1.52 lbs. per head in the same time.

"Ignoring chicks which died during the trial, the heaviest gains were made by White Wyandottes on wet mash and the lightest by White Leghorns on dry feed. Barred Rocks and White Leghorns on wet mash made practically the same gains and weighed practically the same to begin with. The mortality among the Barred Rocks, however, was much greater than among the Leghorns. The gains made by the Brahmas and Cochins were practically alike. The Rhode Island Reds made the poorest gains of any breed on wet mash and the best on dry mash. The Rhode Island Reds and Barred Rocks on dry mash, however, were not strictly comparable with the other lots, as they were much larger. The average mortality on wet mash was more than ten times as great as on dry. Only one chick out of 86 died on dry mash, while 19 out of 157 died on wet mash.

"Between the ages of 6 and 13 weeks it required from 4 to 4.75 lbs. of feed to produce a pound of gain. Between the ages of 13 and 26 weeks it required from 4.75 to 5.75 lbs. of feed to produce a pound of gain.

"Chicks forced when young do not make as rapid growth as they approach maturity as those fed a more moderate ration.

"Chicks weighing less than 1 lb. seem to grow faster on a wet mash; those weighing 1.5 lbs. or more do best on dry feed.

"The loss among chicks on wet mash was much greater than among those on dry feed, even when weighing less than 1 lb. each.

"The slaughter tests indicate that the American breeds dress out better than either the Mediterranean or Asiatic breeds, and that in general pullets dress out better than cockerels. When rather small, weighing less than 3.5 lbs., live weight, the cockerels of the Mediterranean and Asiatic breeds seem to dress out better than the pullets."

An experiment in forced molting by partial starving with 18 White Leghorns seemed at first to depress, then increase slightly the egg production, but the net results at the end of 3 months were unfavorable. From incubator tests of 1906 it would appear that eggs set about the middle of April produced the highest percentage of chicks and eggs set the last of May the lowest. "The eggs of the different breeds in order of their weight were as follows: Black Minorca, Light Brahma, Barred Rock, White Leghorn, White Wyandotte, Rhode Island Red,

White Crested Black Polish, Buff Cochin. A great deal may depend upon the strain, as it is known that some hens of any breed normally lay larger eggs than others of the same breeds.

"The weight of chicks when hatched does not seem to be in direct proportion to weight of eggs."

Temperatures of a Rhode Island hen taken during the incubation period are reported. The morning temperature varied from 103 to 105° F. and the evening temperature from 102 to 104.5°. Included in the bulletin are also tables which give full data on amount of grain eaten, the weekly gain in weight, and the percentage of blood, feathers, and other by-products of the slaughter test.

General information on the management of poultry is presented. Colony poultry houses and a trap nest are figured and described. Data are given on the selection of breeding stock, management of incubators, and the feeding and fattening of chickens, construction of fattening crates, killing and dressing poultry, treatment of roup and gapes, and preserving eggs.

The molting of fowls, J. E. Rice, Clara Nixon, and C. A. Rogers (*New York Cornell Sta. Bul. 258, pp. 19–68, figs. 22*).—This includes a study of sequence in plumage in the domestic fowl and experiments in trying to "force the molt" by partial starving.

It was found that a Leghorn chick has pinfeathers for flight when it comes from the shell. "In 2 or 3 days it develops pinfeathers that will become main tail feathers. The down grows longer and on certain areas of the body develops shafts. Within a few days the shafts burst open, allowing the web of the feather to spread out, but the down often clings to the tip of the opened feather. The ragged appearance to be noticed on 2 or 3 weeks' old chicks is due to this clinging of the down tips. The first body feathers to appear are those at the throat, just above the crop. From this point a line of feathers extends down each side of the crop and breast. When this line begins to show, a tuft appears on each thigh and a line down the spine. The feathered areas increase in size as the chick grows older, so that at the age of 4 or 5 weeks they have grown together and the healthy chick looks to be well feathered. . . . The first feathers were stained red and those that replaced them were stained black. At the age of 8 weeks all the red feathers in tail and wings had been molted, and at 13 weeks all the black feathers had been replaced by white ones."

Just before maturity another molt takes place. "The pullets appeared to undergo this molt whether they laid or not. After the pullets began to lay they seemed to shed no more feathers so long as they continued in production. When they ceased to lay many of them began to molt. In some cases the molt was complete, extending to the flights and the tail; in others it went no farther than the body feathers, while in still others it included only a few feathers on different parts of the body. . . . The first mature molt comes at the end of the first year of laying. . . . The rotation followed closely that of the prenuptial molt before egg production commenced—the oldest feathers being shed first."

To test forced molting 232 single comb White Leghorns were divided into 6 lots. "The attempt to force the molt was by means of restricting the amount of food rather than by changing the quality of the ration. The starvation period lasted for 4 weeks. In the first week the amount of food was gradually reduced to one-half the usual quantity. In the following 2 weeks about one-third rations were fed, which were gradually increased in the fourth week till, at its close, the flocks which had been starved were given all they would eat." To aid in observing the molt and to detect quickly fowls that had escaped from the pens the hens were dipped in proprietary aniline dyes, orange, violet, carmine, and green being found to be the most enduring colors.

The starved fowls lost an average of 0.42 lb. in weight during the process of molt, losing weight in every case but many regaining the lost flesh before the molt was completed. "About one-half of the fowls in all of the flocks were beginning to molt in the first period, beginning August 11, and on September 29, 1907, about 90 per cent of the starved hens and 78.8 per cent of the fed hens were molting. By October 27 the percentage of molting was about equal and continued on this equality to the end of the molt. In regard to new plumage, on October 27, only 6.3 per cent of the starved hens and 5.9 per cent of the fed hens were completely refeathered. November 25 only 34.4 per cent of the starved, and 62.2 per cent of the fed hens were completely renewed, while as late as December 30, there still remained 16.6 per cent of the starved and 15.5 per cent of the fed hens which were not in their new coats.

"On the whole it may be said that from August 25 to October 23 the starved flocks showed a larger percentage of individuals molting. After that time there was more molting among the fed hens, though both flocks completed the molt at about the same time. . . . The average time required to complete the molt of the 3-year-olds was nearly 104 days; of the 2-year-olds, about 101 days, and of the 1-year-olds, 82 days. The starved 1-year-olds averaged to molt more quickly by 33 days, than did the fed; the starved 2-year-olds were little affected; while the starved 3-year-olds averaged 20 days longer in molting than did the fed birds. The average time required to complete the molt of the three starved flocks were 93.8 days; of the three fed flocks 97.4 days.

"All this would indicate that the molting process continues much longer than is usually supposed, and that there is considerable variation in the time of beginning the molt between different individuals, and between flocks of different ages, also a wide variation in the length of time it requires individuals to complete the molt. One is further impressed with the fact, that, so far as this experiment is concerned, the method of feeding did not materially alter the normal conditions of molting, except with the 1-year-old fowls.

"It is apparent that, as molting increased, egg-production decreased. This was true almost without exception with both starved and fed flocks during each period. It was strikingly true during the starvation period. While some of the hens continued to lay after beginning to molt, and a few began to lay before completing their new coat, no hen continued to lay during the entire molting period.

"Persistent layers, unless broody, appeared to begin the molt within a week after the last egg, and were usually in heavy molt in less than 2 weeks. Those beginning to molt after October 1 shed more quickly and re-feathered more quickly than those molting earlier, especially to the stage of advanced molt, when their bodies were well protected.

"Broodiness influenced the time of molt to a great degree. . . . The mortality in all the pens was large. It averaged 18.8 per cent among the starved and 20 per cent among the fed flocks. The two flocks of 3-year-olds had a mortality of 21 per cent; the 2-year-olds 16 per cent, and the 1-year-olds 20 per cent. . . . In these observations it was found that the hens, from all pens, which began to molt before September 15, averaged 108 days molting, while those which began after that date molted in 81 days. . . .

"In the absence of reliable data as to the best method of feeding fowls during the critical period of the molt, it would seem desirable to follow the practice commonly believed to be correct; namely, to feed liberally on rations which are easy of digestion and rich in protein and oil. . . .

"The rotation of molting was practically the same with hens of all ages—the oldest feather being shed first. The chick and hen both feathered more

quickly in such areas as would protect the vital parts. From the incubator to the laying period the chicks experienced at least four molts, either partial or complete.

"Hens have individual traits as to season of molting, but seldom as to rotation of molt. Young hens molted more quicky than older ones. . . .

"The 'forced molt' in one year did not influence materially, as to time and completeness, the molt of the succeeding year. . . .

"The starvation process appeared to increase broodiness. . . . As compared to the fed flocks, the starved hens molted slightly earlier and more uniformly. They were in somewhat better condition at the end of the molt; molted (average) in slightly less time; gained less above first weight during molt; gained slightly more in weight during the year; resumed production somewhat more quickly after molt; laid a few more eggs during winter; were materially retarded in egg production; produced less eggs after the molt was completed; produced eggs at a greater cost per dozen; consumed slightly less food during the year; had slightly less mortality; showed slightly more broodiness; paid a much smaller profit.

"The fowls produced the largest profits in the order of their ages. The 1-year-old hens produced the greatest number of eggs and gave the largest net profits. The 2-year-olds were a close second with the 3-year-olds somewhat farther behind, having, however, a good balance profit to their credit.

"There was considerably less mortality in the 2-year-olds, which were hopper fed dry mash, than in either the 1-year-olds or 3-year-olds, which were fed a wet mash."

DAIRY FARMING—DAIRYING.

Home-grown rations in economical production of milk and butter. J. N. PRICE (*Tennessee Sta. Bul. 80, pp. 31–50*).—Experiments to demonstrate the value of feeding home-grown rations to dairy cows are reported. "The feeds used in this experiment were corn silage, corn stover, alfalfa hay, soy-bean straw, soy-bean meal, corn-and-cob meal, cotton-seed meal, and [a proprietary] dairy feed. Corn silage was the basis of all the rations, every cow getting corn silage throughout the entire experiment. The other feeds were so combined that soy-bean straw was fed against corn stover, soy-bean hay against alfalfa hay, and soy-bean meal against cotton-seed meal." Analyses of these feeds are given. Each experiment comprised three periods of 30 days each and included 2 lots of 4 cows each.

The average yield per lot per period on the corn stover ration was 1,757 lbs. milk, at a cost of 7.9 cts. per gallon, and on the soy-bean straw ration it was 1,978 lbs. milk at a cost of 6.66 cents per gallon. In the experiment in which alfalfa hay was compared with soy-bean hay, the average yield on the alfalfa hay ration was 1,822 lbs. milk, at a cost of 9.44 cts. per gallon, and on the soy-bean hay ration 2,067 lbs. milk, at a cost of 3.96 cts. per gallon. When soy-bean meal was compared with cotton-seed meal as a supplement to corn-and-cob meal, corn silage, and alfalfa, the average yield on the cotton-seed meal ration was 1,633 lbs. milk at a cost of 10.17 cts. per gallon, and on the soy-bean meal ration 1,723 lbs. milk at a cost of 9.47 cts. per gallon.

"A ton of soy-bean hay that will yield 560 lbs. of beans and 1,440 lbs. of straw, and can be produced for $7, has a higher feeding value than a ton of alfalfa hay, which at present prices will cost from $20 to $25 on the market. . . .

"Since the home-grown rations used in this experiment produced larger yields, kept the animals in better health, and greatly reduced the cost of pro-

duction, and since such feeds can be produced on any Tennessee farm, the dairymen of this State should resort to the growing of their own dairy feeds as a relief from present market conditions. . . .

"The following rotation is recommended for Tennessee:

"1st year: Red clover (two crops for hay, or one for hay and one for fall pasture) or alsike (one crop for hay and one for late pasture).

"2d year: Clover followed by soy beans. (Vetch may be sown in the beans in August and top-dressed with six loads of manure during the winter, and turned under in the spring for green manure).

"3d year: Corn for grain, stover, and silage.

"4th year: Oats and vetch, or rye and vetch, or barley and vetch, for green feed or hay; or barley, oats, or wheat for grain."

Two milking machines have been used at the station for a year and a half. The following conclusions were drawn:

"Under the conditions existing during the test at the station, machine milking has been at least equal, if not slightly superior, to hand milking.

"Under average conditions a cow is milked as clean with the machine as by hand. An expert operator can milk cleaner with the machine than the average man will by hand.

"If the teat-cups and mouthpieces are properly adjusted the machine is not injurious to the teats and udder or objectionable to the cows, some even preferring it. . . .

"Troubles that occur in operating are due more to misuse than to any fault of the machine."

Records from Indiana dairy herds, O. F. Hunziker, H. A. Hopper, and H. J. Fidler (*Indiana Sta. Bul. 127, pp. 163–216, figs. 26*).—This bulletin is the result of 2 years' work in collecting and arranging data concerning the annual production of milk and butter fat of Indiana cows, the cost of feed per cow, the relation between yield and profit, and the influence of pure-bred stock upon production and profit. Records of individual herds are given with numerous suggestions for increasing the profits of dairy herds.

"The average of 197 yearly records was: Milk, 5,901.5 lbs.; butter fat, 244.5 lbs.

"The best herd averaged 6,656.6 lbs. of milk and 301.1 lbs. of butter fat. The poorest herd averaged 3,347.5 lbs. of milk and 152.8 lbs. of butter fat. The best cow produced 10,426 lbs. of milk containing 448 lbs. of butter fat. The poorest cow produced 3,248 lbs. of milk containing 109 lbs. of butter fat. . . .

"With the prices used, the best herd returned $2.56 for $1.00 in food, while the poorest herd returned only $1.20. . . .

"The average profit in graded herds was $36.04; in nongraded herds $19.62. . . .

"Even though these herds are above the average, 6 cows were kept at a loss, 49 cows made less than $11 profit, and 21 per cent of the herds contained unprofitable cows. . . .

"On an average, 100 lbs. of milk cost four times as much as 1 lb. of butter fat.

"The average profit on the 197 cows was $26.80. This can easily be doubled.

"A pure-bred dairy sire is the milk producer's best investment; anything short of a pure-bred male is too expensive at any price.

"Since careful grading and good management have not only increased the production of butter fat 64 lbs. per cow, but also reduced its cost of production 3.5 cts. per pound, rapid improvement should be sought through the continuous use of high-class dairy sires of some recognized breed.

"The dairymen must keep yearly records of their individual cows, discard the poor ones and raise the heifer calves from the best cows by a pure-bred sire. Records for short periods are inconclusive."

The university dairy herd; management and records, 1907–8, G. C. Humphrey and F. W. Woll (*Wisconsin Sta. Bul. 167, pp. 3–27, pls. 2, figs. 5*).—Methods of feeding and management of the university herd are described and the herd records for the year ending May 13, 1908, are tabulated and discussed as in previous years (E. S. R., 20, p. 77).

The herd consists of 8 Jerseys, 8 Guernseys (2 grades), 8 Holsteins, 4 Ayrshires, and 2 Brown Swiss. The cow making the largest profit produced 13,186.2 lbs. milk, with an average fat content of 3.62 per cent, equivalent to 477.96 lbs. butter fat. The product is valued at $140.59, and the feed cost $45.28. For the past 5 years the herd averaged 7,246.1 lbs. milk per cow per year, containing 4.23 per cent of fat, equivalent to 306.16 lbs. butter fat. The average cost of feed was $37.03, and the average value of the product $81.69. The live weight of the cows, amounts of feed eaten, and analyses of the feeding stuffs are given.

Concerning the changes of the bacterial flora of fresh milk during the so-called incubation period, A. Wolff (*Centbl. Bakt. [etc.], 2. Abt. 20 (1908), Nos. 18–20, pp. 545–563; 21–23, pp. 651–675; 24–25, pp. 737–780; abs. in Milchw. Zentbl., 4 (1908), No. 7, pp. 314–320*).—A study was made of the bacterial content of milk from the time of milking until the coagulation period. The milk from one stable was run through a strainer and collected in a covered tin vessel, and that from another stable was run over a cooler into tin cans at a temperature of 15° to 16° C. Extended tables show the bacterial content of milk when kept at different temperatures.

The bacterial flora was divided into six groups, as follows: (1) Cocci; (2) lactic acid forms; (3) short-rod forms not belonging to the coli group, (a) the alkali-producing nonliquefying, (b) the other nonliquefying, (c) liquefying, (d) those unaffected by pasteurizing; (4) coli-aerogenes group; (5) spore-forming, (a) aerobic, (b) facultative anaerobic, (c) obligate anaerobic; (6) miscellaneous. The behavior of the different forms grown as pure cultures is described. Two new species of coccus were discovered, which the author calls *Sarcina mobilis* A. and *S. mobilis* B.

In milk kept at 5° to 7° C. all kinds of bacteria increased for 3 days, especially the cocci and the alkali-producing rods. At 20° all kinds increased faster than at the lower temperatures. The first 3 hours lactic-acid forms were not much in evidence, but after that they made a proportionally larger gain than the others and soon composed over 90 per cent of the flora. At 30° the lactic-acid forms gained still more rapidly and in a few hours were the only kinds present except a few alkali-producing forms. At 37° the lactic-acid forms also increased, likewise the gas-forming coli group. Lactic-acid forms were more numerous in the milk that was run over the cooler than that strained into the covered vessel. They do not grow rapidly at the low temperatures but at the higher temperatures develop so rapidly as to be harmful to many other kinds.

In milk passed over the cooler *Bacterium güntheri* was more abundant than streptococcus at first, but when kept at 5 to 7° the latter increased much the faster. At higher temperatures *B. güntheri* increased as a rule faster than streptococcus, and in raw milk in some temperatures it increases so fast that eventually it checks itself. Although it has generally been supposed that *B. güntheri* does not form spores and is killed by pasteurizing, the author found that acidity caused the germs to adhere in small clumps and that some of them do not succumb to pasteurizing.

Of the spore-building forms the aerobic and the facultative anaerobic were represented by the hay and potato bacillus group and were present in fresh milk only in small quantity and as a rule only in the spore form. In pasteurized milk they gradually increased in number. The obligate anaerobic and the gas-producing bacteria of the coli-aerogenes group were not abundant, but when present they increased at all temperatures between 5 and 37°. With an increase in temperature the same species of coccus forms continued to predominate. The alkali-producing nonliquefying forms appeared able to thrive unhindered by the lactic-acid forms. The liquefying short-rod forms were present in large numbers except at 5 to 7°. After the second day *B. fluorescens* multiplied so rapidly that on the fourteenth day it composed nearly half the bacterial flora.

A bibliography is appended to the article.

The effect of pasteurization upon the development of ammonia in milk. W. G. Whitman and H. C. Sherman (*Jour. Amer. Chem. Soc., 30 (1908), No. 8, pp. 1288–1295*).—The bacterial decomposition of proteins in milk was studied by measuring the amount of ammonia produced. The methods of determining the ammonia were those previously used (E. S. R., 16, p. 946; 18, p. 1077) for examining fresh samples of milk. Ten samples of milk were obtained from different dealers and each divided into three portions, of which the first was untreated, the second pasteurized at 65°, and the third pasteurized at 85°.

The average amount of ammonia found in the raw milk after 2 days was 0.0056, after 4 days 0.0081, after 7 days 0.0065 per cent. In the portion pasteurized at 65° the average per cent of ammonia after 2 days was 0.0011, after 4 days 0.0057, and after 7 days 0.0065 per cent. In the portion pasteurized at 85° the results were 0.001, 0.0047, and 0.0116, respectively. There was a steady increase in "cleavage ammonia" in all samples of raw milk during the first 10 days, but practically no gain after that. The pasteurized milk, on the contrary, showed little increase the first 10 days but after that the "cleavage ammonia" increased rapidly. From the second to the seventh day of standing the acidity and ammonia increased in about the same proportions. Pasteurization retarded souring but favored the development of an offensive putrid odor and a bitter taste.

"Ammonia as a measure of the decomposition of proteins in milk appears to be especially useful in samples which have been pasteurized at high temperatures and in which the development of ammonia is continuous; in samples which have been pasteurized at low temperatures or not at all, the sanitary significance of the ammonia determination is less certain, since the ammonia content at any given time can not be assumed to be proportional to the extent to which protein decomposition has taken place."

Chemical evidence of peptonization in raw and pasteurized milk. Rachel H. Colwell and H. C. Sherman (*Jour. Biol. Chem., 5 (1908), No. 2–3, pp. 247–251*).—This study was undertaken to supplement that of ammonia content noted above. Nine samples of milk were mixed and divided into four portions. One portion was untreated and the others pasteurized by heating for 20 minutes at 60, 70, and 90°, respectively. The samples were then cooled and allowed to stand at room temperature. After 2 and 4 days they were tested for odor, acidity, and peptone.

"The results of this investigation, together with that of the effect of pasteurization upon the development of ammonia in milk, tend to emphasize from the standpoint of the subsequent chemical changes the desirability of low temperatures as recommended by Rosenau and others, in pasteurizing milk when necessary as a safeguard against infectious diseases and the objectionableness of depending upon pasteurization as a preservative measure. The importance of keeping milk cold and consuming it quickly are apparently not diminished

by its pasteurization even under conditions so favorable as to preclude subsequent contamination."

A study of moisture in butter, G. L. McKay and J. Bower (*Iowa Sta. Bul. 101, pp. 156–177*).—This bulletin contains the results of a series of experiments conducted with butters obtained from different sources to ascertain the effect of different percentages of moisture on the keeping quality and flavor of butter, and a method of controlling the moisture content is presented.

Of 107 samples examined, 11 showed a moisture content of over 16 per cent and when scored for quality averaged 86.68. Eleven samples containing between 15 and 16 per cent scored 89.3. Eleven samples contained between 14 and 15 per cent moisture and scored 89.84. Thirty-two samples that contained between 13 and 14 per cent scored 90.3. Forty-two samples contained less than 13 per cent moisture and scored 89.02. "The lowest moisture content of any sample . . . is 8.6 per cent. The average score of this butter is 80. The highest is 23.01 per cent with an average score of 88.25. The highest average score is 95.25. This sample shows a moisture content of 15.29 per cent." These results are somewhat different from those noted in earlier work (E. S. R., 16, p. 916). "It is therefore impossible to state that high-water content, between 15 and 16 per cent, necessarily means a low score or that a low-water content, below 13 per cent, means a high score, or vice versa."

Data obtained in educational scoring contests in Minnesota and Wisconsin are summarized in conjunction with those of this station, and the conclusion is drawn that there is no definite relation between the score and the moisture content.

The bacteriological effect of various waters on milk, cream, and butter was studied by F. W. Bouska, with the following conclusions: "Most waters produce flavors in pasteurized milk and cream. In pasteurized cream with a starter added, and in raw cream, only some waters produce flavors. Flavors are usually produced in butter from unripened cream and in unsalted butter, but only by some waters in salted ripened cream butter. Waters containing bacteria will not necessarily produce bad flavors. To accomplish this the bacteria in question must be able to grow in competition with other bacteria in the presence of salt and lactic acid."

In continuation of earlier work (E. S. R., 15, p. 397) on the keeping quality of butter, 25 samples of butter were scored when fresh and after keeping in cold storage 6 months. "Taking the average results given, there was a slight gain in points given for flavor in favor of the butter containing the higher percentage of water. There is also shown a certain gain in points given for body. The butter containing the lower moisture content appears from the scores given to have lost slightly in flavor, two of the samples being scored off one point." Of the samples sent to English markets those having the lower amounts of water received the highest score, but this may be due to different methods of scoring. "Contrary to the opinion expressed by some writers, that only 14.5 per cent of moisture could be obtained by churning in the granular condition, as high as 15.8 per cent was obtained."

Three types of churn were used in studying methods of controlling the moisture content in order to obtain data upon which to base further experiments. "In no case was overchurning practiced. The aim was to get a complete gathering of fat, without precluding the possibility of removing the buttermilk. The granules, on completing the churning, might be described as having an irregular minute granular condition collected loosely into larger irregular forms. This allowed of thorough washing of butter to get rid of the buttermilk, and at the same time reduced the loss of fat in the buttermilk. Tests from time to time showed from 0.05 per cent to 0.12 per cent. The butter

was first sprayed. It was then washed thoroughly, using about as much water as buttermilk. The water was then removed and fresh water added. Then the rollers were put in motion and butter worked off in the water, using slow gear. . . . After the first few churnings all the cream was pasteurized at a temperature ranging from 165 to 185° F. From 5 to 15 per cent starter was added and in most cases immediately cooled to churning temperature. It was then held over night and churned the following morning. A record of the churning was kept and butter analyzed for moisture by the official method."

The moisture content ranged from 13.33 to 19.76 per cent, but after an effort was made to control it the percentage ranged from 13.73 to 16.3. "Where creameries are not supplied with the necessary machinery to control the temperature, where no attention is paid to the other factors and where unskilled men are employed, there can be no control of moisture. . . . Leaky or slushy butter does not mean butter of high moisture content. . . . Overrun is no indication of moisture content. . . . It is possible to control moisture so that a variation exceeding 1 per cent above or below a safe margin need not be exceeded. Under favorable conditions it need not be more than 1 per cent.

"In all cases extreme temperatures should be avoided, though no set temperature can be recommended because of the multiplicity of conditions. Large churnings, rich cream, cream which has been subjected to uniform conditions, such as cream of whole-milk creameries, are favorable factors in control."

Proteolytic changes in the ripening of Camembert cheese, A. W. Dox (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 109, pp. 24*).—The investigations reported were carried on in cooperation with the Connecticut Storrs Station.

The author finds that the most potent factor in ripening of Camembert cheese is the proteolytic enzym of *Penicillium camemberti*. This enzym is of the nature of erepsin although tryptophan is absent. Galactase, rennet, and lactic acid bacteria have little to do with ripening, which begins at the surface and works toward the center. When paracasein, the principal protein, is hydrolyzed, the resulting products are caseoglutin, peptones, caseoses, polypeptids, amino-acids, and ammonia. Paranuclein was not found, and hence the ripening of Camembert cheese can not be a peptic digestion.

An aqueous extract of cheese was acidified and the precipitate washed, dried, and the fat extracted with ether. A small part of the remaining precipitate was found to be soluble in a 5 per cent solution of sodium chlorid, while the greater part was soluble in 50 per cent alcohol. The smaller fraction was "dissolved in alkalis, reprecipitated by acids, excess of which dissolved the precipitate. The substance was readily attacked by trypsin, dissolving completely in 24 hours and giving a solution from which no precipitate was obtained by saturation with ammonium sulphate."

The analysis of a sample dried at 110° C. showed that it was paracasein. The alcohol soluble part was poured in water and the gummy precipitate was dried, extracted with ether, analyzed, and its analysis and properties were found to agree with those of caseoglutin, which has not been observed before in digestions with pure enzyms. No tyroalbumin was found.

The caseoses of the cheese were separated into the four fractions described by Pick (E. S. R., 9, p. 723), as follows:

"Protocaseose, by half saturation of the neutral solution with ammonium sulphate; deuterocaseose A, by two-thirds saturation; deuterocaseose B, by complete saturation; and deuterocaseose C, by acidifying the filtrate from B. In the early stages of ripening, the protocaseose predominates. In the ripened cheese, however, protocaseose and deutero B are present in about equal amounts, and together form about three-fourths of all the caseoses. A distinction will be noticed here from the albumose formation observed by Zunz in peptic diges-

tion. According to Zunz, after deutero B has reached its maximum, deutero A predominates, and finally deutero C."

Heteroalbumose could not be derived from the casein, although traces were found which probably came from albumin. The filtrate from the caseoses was treated with ammonia and ferric ammonium sulphate. The resulting brown precipitate corresponds to the α- and β-peptones of Siegfried. Further treatment by washing with iron alum, decomposing with barium hydroxid, expelling the ammonia, removing the barium with sulphuric acid, and concentrating in alcohol gave a substance analogous to Winterstein's α-peptone (E. S. R., 16, p. 196) in the precipitate, and β-peptone in the filtrate, present in equal amount and comprising about 1.6 per cent of the cheese. After the removal of caseoses and peptones, polypeptids were found.

Using Kossel's older method (E. S. R., 10, p. 313), diamino acids or hexone bases were found in a 3 kg. sample of cheese in the following amounts: Histidin 1.1 gm., arginin 0.6 gm., and lysin 1.9 gm. Other hexone bases were present in small amounts. Another 3 kg. lot of cheese, examined for monoamino acids, yielded about 5 gm. glutaminic acid, 8 gm. tyrosin, and 14 gm. leucin. Folin's method is recommended for the determination of ammonia. The author failed to find indol, skatol, mercaptan, hydrogen sulphid, phenols, and other putrefactive products except in cheese otherwise unfit for eating. The greater part of the phosphorus is liberated and appears as acid calcium phosphate.

Paraffining butter tubs, L. A. Rogers (*U. S. Dept. Agr., Bur. Anim. Industry Circ. 130, pp. 6, fig. 1*).—By applying paraffin to butter tubs there is less loss of weight in the butter, as is shown in the following experiment: Twelve paraffined tubs containing 766½ lbs. of butter lost 7¼ lbs. in shipment. A similar lot of 12 paraffined tubs containing 756 lbs. of butter lost only 1¼ lbs. "If properly applied 2 or 3 oz. of paraffin should be sufficient to coat a 60-pound tub. A good grade of paraffin can be bought for 8 or 9 cts. a pound.

"It is more difficult to prevent mold on prints wrapped in paper and packed in boxes, because the air can not be excluded as it can in tubs. The boxes may be protected from mold by paraffining. Liners should be stored and protected from dust, and cartons should be so paraffined that they will not absorb water." The proper temperature to apply the paraffin is about 240° F. The author has devised a machine for spraying the paraffin on the tub, which is described.

Officials, organizations, and educational institutions connected with the dairy interests, 1908 (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 135, pp. 31*).—This contains an address list of the principal officials in the Dairy Division of this Department, State dairy officials, National, International, Canadian, and State dairy associations, medical milk commissions and associations of breeders of pure-bred dairy animals, outlines of courses in dairying in agricultural colleges and other institutions, and an outline of the work carried on by the Dairy Division and also that in the interest of dairying conducted by the Farmers' Institute Specialist of this Office.

VETERINARY MEDICINE.

Report of the department of veterinary science and bacteriology, 1907, W. B. Mack (*Nevada Sta. Bul. 63, pp. 43–52, pls. 4*).—An account is given of a horse affected with chronic hydrocephalus, of pervious urachus in a foal, and of traumatic pericarditis in a heifer. A detailed report is also given of the symptoms found in sheep that had fed on poisonous plants and of the result of postmortem examinations. The condition found in a fowl affected with fibro-sar-

coma, the author summarizes as follows: "There was a generalized malignant tumor growth of fibro-sarcomatous character, apparently originating in the ovary or oviduct, spreading by metastasis throughout the generative system and the mesenteric circulation, causing a thickening and hardening of the tissues, marked venous stasis, extensive ascites, cachexia, and finally death."

Annual reports of proceedings under the diseases of animals acts, the markets and fairs (weighing of cattle) acts, etc., for the year 1907 (*Bd. Agr. and Fisheries [London], [Vet. Dept.], Ann. Rpts. Proc., 1907, pp. 97, maps 6*).—A general report is presented of the outbreak of infectious diseases of animals and the work of control in Great Britain. Maps showing the relative number of outbreaks of sheep scab and swine fever for the years 1905, 1906, and 1907 accompany the report and statistical data are appended. There were no confirmed outbreaks of rinderpest, rabies, sheep pox, foot-and-mouth disease nor pleuro-pneumonia during the year. There was a noticeable decrease in the outbreaks of glanders, while swine fever and sheep scab greatly, and anthrax slightly, increased in number of outbreaks.

Attempts were made to determine in what material anthrax spores might be introduced on the farm, as circumstantial evidence had particularly pointed to feeding cakes. In connection with experiments along this line the author states that "the number of samples of cake examined up to date is 58, and in addition 14 samples of other feeding stuffs, including barley meal, rice meal, Indian meal, compound meals, barley dust, and molassine meal, and in no case has a positive result been obtained with them."

A parasitic mange order which deals with horses, asses, and mules was in force, 228 outbreaks having been reported.

Report of the principal veterinary surgeon, C. E. Gray (*Transvaal Dept. Agr. Ann. Rpt. 1904–5, pp. 60–74, map 1*).—Rhodesian redwater returns show a decrease of about one-half in the number of outbreaks recorded and a corresponding decrease in the number of deaths. Success in dealing with East Coast fever has been due to the East Coast fever ordinance, which gives the department power to slaughter stock running on infected farms and to fence in infected or suspected areas on terms favorable to the owners. Glanders and lung sickness decreased in prevalence while ulcerative lymphangitis increased during the year. Rinderpest did not reappear. The author also reports on the occurrence of mange, swine fever, anthrax, scab, and tuberculosis.

Report of the principal veterinary surgeon, C. E. Gray (*Transvaal Dept. Agr. Ann. Rpt. 1905–6, pp. 61–80, map 1*).—Quarantine has been removed from numerous areas which were formerly infected with East Coast fever and many of these have been successfully restocked with cattle. Opposition to the compulsory fencing of infected and suspected farms and locations has died out to a great extent and applications for the enclosure of farms under the East Coast fever ordinance are said to be increasing. Under this ordinance Sekukuniland was enclosed as a whole and an infected section therein fenced off for the purpose of protecting native cattle to the number of 17,000 that are still healthy. There was a considerable decrease in the number of fresh outbreaks as compared with the previous year. An increase in the number of outbreaks of glanders and swine fever is reported. Lung sickness, epizootic lymphangitis, and mange are said to be on the decline. Only 10 outbreaks of anthrax were recorded during the year. Tuberculosis has not made much headway and rabies has not made its appearance in the Transvaal, though prevalent in Rhodesia.

Report of the government veterinary bacteriologist, A. Theiler (*Transvaal Dept. Agr. Ann. Rpt. 1904–5, pp. 75–187, pls. 2*).—In this report the author gives a detailed account of investigations conducted during the year 1904–5.

The main object is said to have been that of the study of horse sickness, especially the production of serum that would be free from hemolytic effect. This is considered as having been accomplished since the results of the last experiments resulted in a loss of but 3 per cent due to horse sickness. Biliary fever or piroplasmosis of the horse, mule, and donkey has been determined to be due to same species of Piroplasma. The native equines are said to be immune to the disease while imported animals are susceptible. The disease is inoculable with blood of an immune horse into a susceptible mule. The strongest immunity against this disease may break down under the influence of a virulent fever such as that of horse sickness.

It has been determined that immune cattle do not carry East Coast fever infection. Experiments indicate that it is possible to clean an infected area, even when there are susceptible cattle running on it, if the cattle as soon as their temperature rises are confined so that they are not allowed to drop ticks on the pasture.

From experiments conducted the author concludes that the natural transmission of spirillosis is due to the progeny of *Rhipicephalus decoloratus* that have developed on cattle suffering with or immune from spirillosis. It was found possible to inoculate spirillosis into susceptible cattle and sheep with the blood of sick and immune animals.

Results obtained from heartwater experiments are said to indicate that it is possible to produce a serum which may be applied against the disease. Experiments in immunizing sheep against blue tongue show that the serum of immune sheep hyperimmunized to the extent of 500 cc. of virulent blood injected at different intervals has highly developed protective qualities which it is thought will permit of its use for practicable injection. Swine plague was for the first time discovered in the colony. A swine fever or complication of swine fever and swine plague also occurred. Bursattee, a wound disease caused by a hyphomycete and known in India among horses was observed in one case. As a result of preliminary dipping experiments the author recommends dipping as a measure for cleaning a farm from ticks, but it should be carried out systematically and for a long period. Pleuro-pneumonia is considered to be on the decrease. A herd of camels imported from Somaliland was destroyed having been found infected with surra.

Report of the government veterinary bacteriologist, A. THEILER (*Transvaal Dept. Agr. Ann. Rpt. 1905–6, pp. 81–109*).—A piroplasmosis which has been determined as distinct from *Piroplasma bigeminum* is here described as *P. mutans*. It has been found that an animal can be infected with the former singly and later with the latter. *P. mutans* has all the characteristics of *P. bigeminum*, as it remains in the immune animal and can be transmitted with the blood.

The inoculation of mules against horse sickness for the public was started in November. During the year 2,325 mules were inoculated in the Transvaal with a loss of 3.8 per cent from inoculation, while in Rhodesia 388 mules were inoculated with a loss of 2.3 per cent. In connection with the injection of serum it was found that various kinds of virus from immune animals were more virulent than those in use. This is said to make it necessary to alter the method of inoculation. Experiments undertaken to determine the possible rôle of mosquitoes in the transmission of horse sickness failed, as it was not possible to keep the mosquitoes alive in the stable. This, however, is said to be in accordance with the theory that the disease is thus transmitted as stable horses do not as a rule contract the disease. Equine piroplasmosis has been

found to complicate horse-sickness inoculations in mules to the extent of 0.8 per cent and to be responsible for 14.3 per cent due to hyperimmunization. That the disease is inoculable with immune blood is said to have been demonstrated during the previous year. Inoculations of mules with immune blood is considered as having proved a complete success. As some of the donkeys inoculated suffered somewhat severely, it is recommended that inoculations of imported animals be made only under the most favorable conditions. While inoculations of susceptible horses with immune donkey blood proved a failure there is said to be better prospect of utilizing the blood of immune mules. The disease has been experimentally determined to be transmitted by *Rhipicephalus evertsi* and not by *R. decoloratus*. This tick takes the infection in the larval and nymphal stages and transmits it during the adult stage.

The author confirms the work of Dorset, Bolton, and McBryde of this Department in finding hog cholera to be caused by an ultravisible virus that can be inoculated with blood. The author's observations seem to support the view that hog cholera is the disease and swine plague the complication.

Details are given of the routine work, and a tabulated record of the results of examinations of pathological specimens and blood smears received is appended.

Additional investigations of bovine and human viruses, L. Cobbett and A. S. and F. Griffith (*Roy. Com. Tuberculosis, Second Interim Rpt., 3 (1907), pt. 2, App., pp. V+261, pls. 3, charts 16*).—This volume contains results of experiments conducted in addition to those previously noted (E. S. R., 20, pp. 184, 185), with the object of throwing light on collateral questions. Among those reported are the following: Cultural characters of the bovine tubercle bacillus; changes in reaction produced in broth by human and bovine tubercle bacilli; modification experiments with tubercle bacilli of bovine origin; minute nonprogressive tubercles found in calves injected with tubercle bacilli of human origin, which are unable to provoke a progressive infection in this species of animal; the distribution of nonvirulent tubercle bacilli of human origin in the body of the calf after subcutaneous injection; and dissemination of tubercle bacilli in different species of animals after subcutaneous inoculation.

The tuberculosis problem, A. R. Ward and C. M. Haring (*California Sta. Bul. 199, pp. 221–234, figs. 2*).—During the past 4 years the station has made tuberculin tests of dairy cows in the various counties of the San Francisco Bay region and in the Sacramento and San Joaquin valleys. "In all 1,976 tests have been made, of which 453 (22.9 per cent) showed reactions. Only 4 herds, the largest consisting of 39 cows, were free from tuberculosis. A much smaller proportion of isolated cows were affected than those in herds. Of 71 animals, isolated, or in groups of 5 or less, only 6 (8 per cent) reacted. A more accurate statement of the prevalence of tuberculosis, as shown by our experience, would be one compiled from results of the tests of whole herds the first time that they had been tested. In this case the figures show 1,022 animals tested, with 326 condemned (31.9 per cent). Tuberculosis was found in 82 per cent of the herds tested."

A general account is given of the disease and of the methods by which it may be controlled. The tuberculin testing outfit is described and directions given for making the test. It is stated that under conditions to be personally arranged between the inquiring dairymen and the veterinarians the station will undertake to supply free tuberculin and give direct assistance in interpreting the temperature records. The authors also consider the prevention of entrance of the disease and methods by which an infected herd can be changed to a healthy one.

Infection through resorption of tubercle bacilli in the gastrointestinal canal, E. Oberwarth and Lydia Rabinowitsch (*Berlin. Klin. Wchnschr., 45*

(*1908*), *No. 6, pp. 298–301; abs. in Bul. Inst. Pasteur, 6 (1908), No. 9, p. 407*).—Experiments were conducted in which tubercle bacilli of bovine origin were introduced directly into the stomachs of young pigs. Examination of one killed 22 hours later showed the presence of the bacilli in the blood, in the lungs, and in the mesenteric glands. In a second which died on the fourth day following the infection the bacilli were found in the liver, lungs, and kidneys. In a third which lived 3 weeks after the infection bacilli were found in the blood, lungs, and mesenteric glands. It appears that tubercle bacilli pass within a comparatively few hours into the blood and lungs and that they can remain for a considerable period in a latent state without the appearance of lesions.

The penetration of the intestinal wall by tubercle bacilli, M. Herman (*Bul. Acad. Roy. Med. Belg., 4. ser., 21 (1907), No. 8–9, pp. 545–556; abs. in Bul. Inst. Pasteur, 6 (1908), No. 9, p. 406*).—In experiments made, negative results were obtained from a monkey. Positive results were obtained in a goat of 4 years, in all of 4 adult guinea pigs used, in 3 of 4 young guinea pigs, and in one of 5 rabbits.

The simultaneous inoculation subcutaneously of a pathogenic bacillus (Sirault's bacillus of meat poisoning) appears to favor the passage of the bacilli through the mucous membrane by lowering the vitality. The irritation of the intestine through the ingestion of the same bacillus appears to have rather prevented the passage.

Split products of the tubercle bacillus and their effects upon animals. V. C. Vaughan and S. M. Wheeler (*Abs. in Med. Rec. [N. Y.], 71 (1907), No. 25, p. 1051*).—The tubercle cell was split up into two portions—cell poison and cell residue. The cultural medium was concentrated and precipitated with five times its volume of absolute alcohol and this precipitate then broken up into two portions, the precipitate poison and the precipitate residue. The portion of the cultural medium left after the removal of the alcoholic precipitate was designated as the final filtrate.

Single doses of the cellular substance were injected into the abdominal cavities of 24 guinea pigs in doses varying from 5 to 200 mg. In no case was death caused directly by the injection, and it gave no immunity to a subsequent inoculation with a virulent bacillus.

The toxic effect of the cell poison on animals was shown to be through the respiratory center. When given in sufficient quantities it killed within an hour both healthy and tubercular animals. There was no evidence that it elaborated any antitoxin, and it was harmful with nothing to recommend it. What was true of the cell poison was equally true of the precipitate poison and the final filtrate. The effects of the cell residue on animals were practically nil. The precipitate residue had no recognizable ill effects upon healthy animals but had some specific effect upon tuberculous animals.

Vaccination against tuberculosis in cattle with bovovaccine, H. L. Russell and C. Hoffmann (*Wisconsin Sta. Bul. 165, pp. 3–13*).—Experiments were made to determine the extent to which bovovaccine immunizes cattle. Thirty-four head of young stock all under 6 months of age that had passed the tuberculin test, though taken from an infected herd were injected May 9, 1906, with bovovaccine and isolated until after a second injection 3 months later. In order to test the infectiousness of the barn originally occupied, 10 nonreacting calves not vaccinated were placed with the vaccinated stock on July 6 to serve as a control. After the second vaccination all experimental animals were pastured with the infected stock and from the beginning of November all animals were housed in the infected barn. Tuberculin tests were made in 3, 5, 8, 14, and 17

months following the second vaccination with the results shown in the following table:

Results of tuberculin tests made upon vaccinated and control animals.

Date tested.	Number tuberculin tested.		Vaccinated.			Control.		
	Vaccinated.	Control.	Positive.	Negative.	Doubtful.	Positive.	Negative.	Doubtful.
May, 1906	34	10	34	.....	.....	.....	10	.....
November, 1906	10	10	1	8	1	0	10	0
January, 1907	24	5	4	18	2	5	0	0
April, 1907	13	10	4	9	0	8	2	0
October, 1907	29	2	8	19	2	.....	2	.....
January, 1908	28	2	6	22	0	.....	2	.....

At a post-mortem examination made in May, 1907, lesions were found in 3 different lymphatic glands and the pleura of 2 of 5 control animals examined. It appears probable that the immunization process sensitizes the animal for a time so that it is more susceptible to tuberculosis than at first. After a time this condition of sensitization disappears and the body acquires increased powers of resistance. Post-mortem examinations of 4 of the vaccinated animals that had given apparent reactions at least twice resulted in the finding of typical more or less extensive tubercular lesions. From the fact that but one reacted within a year after the completion of the vaccination it is concluded that the infection was acquired subsequent to the completion of the immunizing process.

The authors conclude that while vaccination materially increases the resistance of most animals it does not do so in all cases. Considering the expense of the process, the time required, the fact that only young stock can be treated and that they must be separated from all sources of infection during the immunizing process, and that a certain percentage of the vaccinated animals will acquire infection in spite of the treatment, the practicability of the method is considered doubtful. The experiments have not been continued a sufficient period of time to determine the permanence of the immunity produced, but European investigators are said to have found that the immunity induced disappeared within a year or two after the vaccination. The authors do not consider the system in its present stage of development as one to be recommended to the farmers of the State.

Persistence of tuberculin in the body of the goat. A. Slatineano and C. Jonesco-Mihaiesti (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 9, p. 420*).—Tuberculin was found in the blood of a goat 12 days and in the urine 18 days after the injection of 10 cc. into the veins.

Osteoporosis in animals. H. Ingle (*Transvaal Dept. Agr. Ann. Rpt. 1905–6, pp. 198–207*).—Bones from diseased and healthy mules, horses, and donkeys were analyzed, and the following conclusions drawn: "(1) That in animals free from disease, the bones contain larger proportions of total ash, lime, and phosphoric acid than are to be found in the bones of animals suffering from the disease; and (2) that the ratio of nitrogen to ash in the bones furnishes perhaps the easiest and most direct method of judging of the freedom or otherwise of the animal from osteoporosis." Bones of diseased animals also appeared to contain more silica than those of healthy animals.

As a result of his investigation the author believes that the abnormal condition of the bones is induced by the use of foods not necessarily deficient in lime and phosphates, but in which the ratio of lime (and perhaps magnesia)

to the phosphoric acid is too low. He considers the disease probably caused by some organism which finds such a condition of the animal favorable for its development.

A note on the occurrence in America of chronic bacterial dysentery of cattle, L. Pearson (*Amer. Vet. Rev., 32 (1908), No. 5, pp. 602–605*).—An account is given of the occurrence in Pennsylvania of this disease, which is said to have been reported from Europe by Bang under the name of chronic pseudotuberculous enteritis (E. S. R., 18, p. 777), and by M'Fadyean as Johne's disease (E. S. R., 19, p. 183).

Texas fever, M. Francis (*Texas Sta. Bul. 111, pp. 3–13, charts 3, map 1*).—Directions are given for the inoculation of animals and accompanied by charts that show the different types of inoculation fever. From some 5,000 animals inoculated at the Texas Station it is estimated that 3 per cent were lost from inoculation fever and 5 per cent more from fever and casualties during the following year.

In view of the fact that horses are not susceptible to the disease, experiments were made to determine if horse serum could not be used to control Texas fever. Following inoculations with 1 cc. of virulent blood, 5 susceptible yearling steers were daily injected subcutaneously with horse serum in doses varying from 100 cc. in steer No. 1 to 1,000 cc. in steers Nos. 4 and 5. Fever records show that no benefit resulted. To test the hemolytic effect that the serum might have, a Texas cow was injected with 1,000 cc. of horse serum on 3 consecutive days but without producing any apparent sickness. Experiments were also made to determine the possible curative effect that quinin might have. Doses of 2, 4, and 8 dr. were given animals daily during the fever periods but without apparent benefit. Two animals were injected subcutaneously each day for 11 days with bimuriate of quinin with urea, one receiving doses of 5 gm., the other of 10 gm. This was commenced on the third day following the inoculation of 1 cc. of virulent blood. No beneficial effects were obtained while in both animals symptoms resembling tetanus developed, the cramps and rigidity becoming so intense that both died. When quinin was injected intravenously it apparently paralyzed the cardiac muscles and the author considers the drug too dangerous to give in this way.

Swamp fever, G. A. Charlton (*Ann. Rpt. Dept. Agr. Prov. Saskatchewan, 1906, pp. 146–152*).—For many years a very fatal disease of horses has been observed at various points in the Canadian west. Though most commonly called swamp fever it has been known as pernicious anemia, typhoid fever, malaria, influenza, mud fever, etc. The term swamp fever owes its origin to a belief that the sickness is caused by the eating of hay cut from the sloughs or by the drinking of slough water. The evidence obtained fails to indicate that the use of such hay or water has any direct influence in causing the disease. From analogy with other diseases known to be transmissible by insects it seems very probable that this disease is carried by some bloodsucking insect. The localities in which the disease occurs are usually low lying districts in which sloughs are found and which are most favorable to the development of certain insects.

The season of the year during which the disease is most prevalent extends from July to December. Among the striking points that are observed in the study of cases is the advancement that the disease has made in many instances before objective symptoms are noted. The anemia, which is one of the most notable features of the disease, is frequently so marked and progressive as to justify the designation pernicious.

On two farms reported the mortality amounted to nearly 80 per cent of the horses affected. A proportion of the animals that apparently recover are

subsequently unfitted for work. Rabbits, young cats, and a dog were injected subcutaneously with blood and gland juice from typical cases. Two of the smaller cats thus treated died within a day or two of each other about 3 months after injection, but the symptoms shown were not sufficiently characteristic to permit one to say that they died of swamp fever. Two horses were injected subcutaneously with blood from cats that seemed to show positive symptoms and a third with blood from a horse suffering with the disease without evidence of infection. Although many examinations have been made the search for a specific organism in the blood has not so far been successful.

The artificial impregnation of mares. L. VAN MELDERT (*Ann. Gembloux, 18 (1908), No. 8, pp. 461–469, figs. 8*).—A description of the process and the implements used by veterinarians in France.

Pathological investigations of fowl cholera. W. JUNGKLAUS (*Pathologisch-anatomische Untersuchungen bei akuter und chronischer Geflügelcholera. Inaug. Thesis, Leipsic, 1908; abs. in Bul. Inst. Pasteur, 6 (1908), No. 10, p. 457*).—The author considers an examination of the blood in septicemic forms and inoculation in chronic forms always necessary to confirm the diagnosis.

Experiments in the transmission of spirillosis of fowls by Argas reflexus. C. SHELLACK (*Centbl. Bakt. [etc.], I. Abt., Orig., 46 (1908), No. 6, pp. 486–488; abs. in Bul. Inst. Pasteur, 6 (1908), No. 12, p. 554*).—In 2 of 4 cases in which *A. reflexus* was used the author succeeded in transmitting *Spirochæte gallinarum*. In one case infection was induced by the bite of 4 ticks that had become infected 7 days before. The second case followed the bites of 6 ticks of which the most recently infected had been fed 64 days before on a fowl affected with spirillosis.

On the penetration of eggs by bacteria. G. CAO (*Ann. Ist. Ig. Sper. Univ. Roma, 18 (1908), No. 1, pp. 39–63; abs. in Bul. Inst. Pasteur, 6 (1908), No. 10, p. 472*).—Fresh and unfertilized eggs were found nearly always free from bacteria while 50 per cent of the fertilized eggs were contaminated. It was experimentally determined that microbes quickly penetrate the shell. Fresh eggs delay pollution by micro-organisms when such are placed in contact with the shell and even attenuate their virulence. This, however, is not the case with old eggs. During the first few days the development of bacteria within the egg appears to be slow.

Index-catalogue of medical and veterinary zoology. C. W. STILES and A. HASSALL (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 37, pp. 401*).—The author indexes of medical and veterinary zoology, upon which the present authors have been working for several years, are to be supplemented by subject and host indexes. The present bulletin, which is devoted to trematodes and the diseases caused by them, is the first volume of such indexes. An alphabetical list of specific and subspecific names, with type hosts, is given, but the greater part of the bulletin is occupied with a bibliography of diseases, genera, and specific names.

Friedberger and Fröhner's veterinary pathology, trans. by M. H. HAYES (*Chicago and London, 1908, vols. 1, pp. XX+731; 2, pp. 702*).—In this revised and enlarged edition, prepared by the wife of the late translator, the arrangement of the first English edition (E. S. R., 16, p. 1128) is discarded and the German text and the division of volumes and chapters adopted in the sixth German edition are strictly adhered to. It also contains notes on bacteriology by R. T. Hewlett.

Observations on the veterinary schools in Europe. P. A. FISH (*Amer. Vet. Rev., 32 (1908), No. 4, pp. 449–468, figs. 12*).—This is an account of the requirements for entrance, tuition, courses, equipment, methods, etc., at 12 veterinary colleges in 6 different countries visited by the author.

RURAL ENGINEERING.

Progress in drainage, C. G. Elliott (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 387–404, figs. 8*).—A brief review of the history of drainage is given, beginning with tile drains installed in France as early as 1620, followed by a discussion of the function of water in the soil and the regulation of its amount by drainage.

Outlets are stated to be a prime consideration for all drainage undertakings and must be provided if not available. Natural conditions, therefore, impose a community of interest requiring cooperation upon the landowners. Resulting from this are the State general drainage laws which though simple in principle have met with certain difficulties in operation. "The effectiveness of the law depends upon the attitude of the people who are directly concerned in the proposed drainage."

Unanimity of opinion where the question of sharing cost enters, is difficult to secure and often results in objections to assessments and plans, consequently impeding the progress of the work.

It is stated that results accomplish more in inducing farmers to drain than theorizing, and three examples of successful drainage operations are given. Contributing to the drainage progress which was necessary to meet the improved economic agricultural conditions are the experience of early drainage work and mechanical aids, especially the adaptation of the steam shovel to the excavation of large ditches. The cost has also increased with the price of labor. Mistakes resulting from lack of established precedents and disregard or ignorance of others' experiences have naturally been made, such as too small channels, sizes of drains not proportioned to meet requirements of various soil and climatic conditions, and weak levees, the failure of which retards progress by discouraging landowners.

The future field of drainage engineers is deemed to be not only swamp and uncultivated lands, but the improving of over 20,000,000 acres of land now farmed, the production of which it is believed may be increased 20 per cent. The article concludes with a discussion of the benefits of drainage and of localities which may be drained.

Practical farm drainage, C. G. Elliott (*New York, 1908, pp. XV+188, figs. 46*).—This is a revised edition of the author's book of the same title but has been entirely rewritten with an addition of considerable new material. It presents for the use of farmers the main established theories and methods of drainage applicable to their needs. Of the new chapters, that on cooperative work which is frequently necessary to secure a satisfactory outlet for drains contains some suggestions for sharing the cost when the work is done by mutual agreement. A chapter is devoted to special problems in drainage, which treats briefly of muck lands, erosion of hillsides, salt marshes, alkali lands in humid sections, and bottom lands. The concluding chapter discusses the drainage of irrigated lands, a branch which is stated to be attracting much attention in the older irrigated sections.

Losses of irrigation water and their prevention, R. P. Teele (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 369–386, figs. 4*).—A summary of available data in which are discussed losses from canals, prevention of seepage losses, losses in the application of water to land, and influence of laws, contracts, and regulations on waste of water.

Irrigation in southeastern Australia (*Engineer [London], 106 (1908), No. 2759, p. 504*).—This is a short account of what has been accomplished in reclaiming the arid lands of Australia and of the steps leading to the Murrumbridge project now under construction. This includes a curved dam 232 ft.

high and 910 ft. long at the crest, capable of holding back 766,324 acre-feet of water. Its object is not to raise the level of the water but to hold it back and regulate the flow, which, after passing down in its original bed for 220 miles, is diverted by a low weir into a distributing canal 132 miles long with a branch 34 miles long.

Irrigation and seepage experiment (*Rpt. Cawnpore [India] Agr. Sta., 1907, pp. 66–70, fig. 1*).—This is a brief account of experiments being made to ascertain the amount of water necessary for maize, wheat, and local crops. Two tables furnish the data collected to date.

Physical tests of Iowa limes, S. W. Beyer (*Iowa Geol. Survey Ann. Rpt., 17 (1906), pp. 91–150, pls. 20*).—This article explains the difference between white, brown, and argillaceous or siliceous limes; describes the processes of slaking, setting and hardening, and the preparation of lime mortar; and reports tests of mortars made with high-calcium white limes and magnesian and dolomitic limes.

The limes tested were high-grade products representative of pure white and of magnesian or dolomitic lime. With such limes it was found, as a rule, that the maximum strength is attained at the end of a setting period of 6 to 9 months. "This is most pronounced where the higher percentages of sand are employed. The notable exceptions to this rule are found with the lowest sand-lime ratios, the lower percentages of water used to slake, and are most conspicuous in the strongly dolomitic limes." Since carbonation occurs to only a limited extent during the first 6 or 9 months, the change which occurs during the setting of mortar is considered to be largely the crystallization of the lime hydrate.

"In general, the greatest strength comes with the lower percentages of water used in slaking. Equal amounts by weight of water and of dry quicklime give in the majority of cases the highest results. Higher proportions are detrimental to tensile strength. This is more especially noticeable in the white limes. . . . As a rule, the highest strength is given by the lowest proportions of sand, the curves being about equally divided between equal parts by weight of sand and dry quicklime and two of sand to one of lime." The highest strength was obtained with a 1 : 1 or 50 per cent mixture of lime and sand.

"The white limes require more water to slake properly, generate more heat in slaking, slake much more rapidly, and reduce to a more uniform paste than the magnesian limes. The dolomitic limes set and harden more slowly but in many cases attain strengths so much greater than do the white limes as to be almost out of comparison. They will, therefore, stand greater dilutions of sand and still be sufficiently strong to meet the requirements of practical use."

Modern silo construction, J. B. Davidson and M. L. King (*Iowa Sta. Bul. 100, pp. 94–150, figs. 45*).—This gives the results of investigations of existing silos, and discusses fully the relation of construction to their failure or success, as it was learned that many of the failures were due to improper construction. In answer to circular letters reports of 161 silos were received and 112 silos were examined by the junior author.

It is stated that the essentials of good construction require air-tight walls and doors, walls smooth inside and rigid enough to withstand the pressure of the silage, and an air space between the walls to prevent freezing. The proper location contributes to the success of the silo, and the reports indicate that this should be outside of all buildings. A discussion of the different types and their cost includes silos of wood, brick, concrete, steel, cement-block, and stone, as well as of common building tile, for which there is a design submitted in detail.

How to build a stave silo, B. H. Rawl and J. A. Conover (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 136, pp. 18, figs. 18*).—This gives complete directions for the construction of stave silos and their foundations and contains suggestions for determining the proper size.

[A new pea and bean thresher], F. C. Quereau (*Tennessee Sta. Bul. 79, pp. 26–28, fig. 1*).—A detailed description is given of an implement which this station has tested for 2 years with very satisfactory results. It resembles the ordinary grain separator in general make-up but the distinctive differences are large knife-edged cylinder teeth and notched sharp-edged concave teeth.

It is stated that in the tests, which included 200 bushels of cowpeas and soy beans, representing 8 varieties of the former and 2 of the latter, and with the vines in all degrees of toughness and stages of curing, a surprisingly high percentage of separation resulted.

Electricity and agriculture, W. H. P. Cherry (*Agr. Gaz. N. S. Wales, 19 (1908), No. 11, pp. 869–890, figs. 22*).—This is a popular account of the manufacture of atmospheric nitrates, calcium cyanamid, the Thwaite and other methods of electroculture, radioculture, experiments in electroculture by Lemström, Sir Oliver Lodge, by this Department, the Hawkesbury Agricultural College, and also in South Australia. The possibility of establishing nitrogen-fixing industries in Australia is discussed as well as the application of the electricity as power in household and farm work. A portable farm telephone is described.

RURAL ECONOMICS.

The agricultural and transportation industries, E. Lambert (*L'Industrie Agricole et l'Industrie des Transports. Paris, 1908, pp. 344*).—This book is divided into three parts dealing, respectively, with (1) the plant and the soil, (2) fertilizers, and (3) the relation between agriculture and transportation. It is pointed out in a prefatory chapter that agriculture has developed more slowly than other industries, but that it has greater future possibilities and will undoubtedly outstrip them. A special plea is made for the more complete industrialization of agriculture, and to this end the general adoption of more scientific methods and improved transportation facilities to promptly deliver supplies and move crops are considered essential. The great advantage to agriculture of increased and improved water transportation is particularly emphasized.

The book therefore deals with scientific methods of increasing and maintaining the fertility of soils and with improved methods and means of transportation.

The position of agriculture from the economic point of view, Vibrans (*Ztschr. Landw. Kammer Braunschweig, 77 (1908), No. 31, pp. 364–367*).—The author discusses the food values of agricultural products with a view of inducing interest by the government in a more rational system of taxation. It is believed that the government should encourage the branches of agriculture producing the necessaries rather than the luxuries of life. The author favors the higher taxation of beer and tobacco, the prohibition of or increased duty on the transportation of potash, the reduction of taxation on sugar, and the encouragement of the production of staple crops, the ultimate aim being to make Germany a self-supporting nation.

Note on agriculture in Japan, F. A. Nicholson (*Madras: Govt., 1907, pp. VI+122, pls. 2, fig. 1*).—The area of Japan is given as about 94,000,000 acres, of which only 12,778,124 acres, or 13.53 per cent, was under cultivation in 1905. The population was 47,812,702, and as Japan is practically a self-sustaining people, the whole nation secures its subsistence and other necessaries on an

area of 0.267 acre per head. Japan is a country of small holdings. Farms below 2 acres formed 55 per cent, those between 2 and 3¾ acres 30 per cent, and those above 3¾ acres 15 per cent, the average for the country at large being 2.55 acres.

Information is also given regarding Japanese manurial practices, the preparation of composts, the governmental organization of agricultural education and research, experiment station work, and agricultural associations. Probably in no other country in the world are the latter so general and so well organized as in Japan. Recently there were in existence 58,547 associations in 47 prefectures, 638 counties, and 13,509 towns and villages. The extensive work undertaken by the village associations is also described.

Agriculture in Japan, F. A. Nicholson (*Jour. Jamaica Agr. Soc., 12 (1908), No. 10, pp. 329–333*).—A summary of the above.

Cooperative farming, W. Bulstrode (*London, 1908, pp. 23*).—This pamphlet outlines a plan of cooperative farming on a large scale which if put into practice it is believed would offer a solution of the problem of rural depopulation in England and be of far-reaching and lasting benefit to national prosperity.

The economic and social significance of agricultural cooperative associations in Germany, M. Grabein (*Wirtschaftliche und soziale Bedeutung der ländlichen Genossenschaften in Deutschland. Tübingen, 1908, pp. VIII+196*).—This is a history of the different kinds of agricultural cooperative associations in Germany from their origin to the year 1907.

Land and agricultural banks in European countries, A. K. Eckerbom (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 3, pp. 113–145*).

The farm help problem, B. W. Potter (*Agr. of Mass., 1907, pp. 139–163*).—This is a paper read at the public winter meeting of the Massachusetts State Board of Agriculture held at Boston, December 3–5, 1907.

The speaker discusses the causes of the scarcity of farm help in Massachusetts, chief of which he believes is found in the unprosperous condition of agriculture in the State. Among the remedies suggested are making life more attractive for the laborer on the farm, such as providing plenty of good food, comfortable sleeping rooms or separate homes, not more than ten hours of labor, treating him well socially, and giving him employment the year around; the use of more and better agricultural machinery and the undertaking of those branches of agriculture such as meat production which require the employment of less labor; the proper education of farmers' children to keep them on the farms; the payment of wages commensurate with or superior to those paid in factories and other town occupations; and the selling of products by farmers directly to consumers, either individually or through cooperative associations.

The paper is followed by a discussion.

[Agricultural labor conditions in Germany] (*Ztschr. Agrarpolitik, 6 (1908), No. 10, pp. 528–545*).—Summaries of official reports relating to agricultural labor conditions in the different provinces in 1907 and 1908 are presented in this article.

How can the ever-increasing scarcity of German agricultural laborers be prevented? Kayser (*Deut. Landw. Presse, 35 (1908), No. 84, pp. 882, 883*).—The author shows how the number of rural families have decreased in Germany since 1871 by emigration to America and other countries, removal to the cities, employment on railroads and in the industries, and similar ways, and enumerates the reasons for rural depopulation. The only remedy in the author's opinion is the payment of higher wages to farm hands and giving them better home surroundings. To this end the author proposes to tax every farmer who employs a foreign farm laborer 50 marks a year. This tax it is estimated would yield an income of about 30,000,000 marks (about $7,000,000) which should be de-

voted to the building of better houses for farm laborers. It is believed that this proposal, in connection with the payment of higher wages, would ultimately result again in the increasing settlement of German agricultural families on the land and be a practical solution of the rural labor problem.

Is the agricultural laborer in East Prussia a proletarian? A. HOFFMEISTER (*Ztschr. Agrarpolitik, 6 (1908), No. 10, pp. 516–522*).—The author criticises the conclusions of Weber that the position of the farm laborer in East Prussia is constantly tending to a lower standard of living. On the contrary, from investigations made by the author and others on a large number of farms, the conclusion is reached that industrious families are able to save from 58 to 300 marks and even as high as 500 marks (about $119) annually from their earnings, and that "the economic and social condition of the farm laborer in East Prussia is constantly improving and is not forcing him into the ranks of the proletariat."

The article contains a bibliography relating to the agricultural labor problem in Germany, with particular reference to East Prussia.

Report of the international jury. Agriculture, horticulture, feeding stuffs, L. GRANDEAU (*Rapports du Jury International. Agriculture, Horticulture, Aliments. Paris, Govt., 1905–6, vols. 3, pt. 5, pp. III + 754, figs. 193; 4, pt. 5, sect. 1, pp. 751, figs. 125; sect. 2, pp. 752, figs. 129; sect. 3, pp. 663, figs. 106*).—This is a general treatise on the agriculture, horticulture, and foods and feeding stuffs of the 100 countries in the world, based on the exhibits at the Paris Exposition in 1900. These phases of agricultural economic life are separately discussed, and the data having been compiled from official sources serve as useful comparisons of the population, agricultural production, and rural economy of the nations of the world at the opening of the twentieth century.

Imports of farm and forest products, 1905–1907 (*U. S. Dept. Agr., Bur. Statis. Bul. 70, pp. 62*).—Detailed statements of imports of farm and forest products, including the countries from which consigned, are reported. The value of farm products imported in 1907 was $626,836,808, the value of forest products $122,420,776, both being increases over 1906 (E. S. R., 19, p. 589).

Exports of farm and forest products, 1905–1907 (*U. S. Dept. Agr., Bur. Statis. Bul. 71, pp. 78*).—Detailed statistics of exports of farm and forest products, including the countries to which consigned, are reported. The values of farm and forest products exported in 1907 were $1,054,405,416 and $92,948,705, respectively, as compared with the values of $976,047,104 and $76,975,431 in 1906 (E. S. R., 19, p. 589).

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 11 (1909), No. 1, pp. 1–8*).—The condition of crops in the United States and foreign countries, data on the farm values of principal crops and range of prices of agricultural products in the United States, and special articles on the monthly marketings by farmers of important crops during the year ended June 30, 1908, and the monthly movement of wheat in international trade during 1908 in comparison with similar data for the two preceding years, are reported.

Agricultural statistics of Ireland, with detailed report for the year 1907, W. G. S. ADAMS (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1907, pp. XXXVII + 149*).—Statistical data of crop areas and production, number and classes of live stock, number and size of holdings, bee keeping, and forestry in Ireland during 1907 are reported. The holdings numbered 599,872, of which 516,298 exceeded 1 acre in extent, 153,728 contained between 5 and 15 acres, 135,233 between 15 and 30 acres, 74,799 between 30 and 50 acres, and 58,029 between 50 and 100 acres.

AGRICULTURAL EDUCATION.

Progress in agricultural education, 1907. D. J. Crosby (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 237–306, figs. 18*).—A review is given of the work of the different educational agencies for the promotion of agriculture in this country and abroad, with special attention to the fiftieth anniversary of the establishment of the first agricultural college in this country, the training of teachers in agricultural colleges and normal schools, and descriptions of the agricultural features of instruction in a number of high schools.

Statistics of land-grant colleges and agricultural experiment stations, 1907. Marie T. Spethmann (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 199–236*).—A compilation from official sources of general statistics, courses of study, attendance, value of funds and equipment, revenues, and additions to equipment of the land-grant colleges, and of the lines of work, revenues, and additions to equipment of the agricultural experiment stations in the United States.

Statistics of educational institutions, 1904–5 (*Österr. Statis., 79 (1908), No. 3, pp. LXIII+348*).—Statistics for 1904–5 similar to those for 1903–4 previously noted (E. S. R., 18, p. 995).

A successful agricultural high school (*Pacific Rural Press, 76 (1908), No. 13, pp. 193, 204, 205, figs. 6*).—A description of the organization, equipment, and courses of study of the California Polytechnic School at San Luis Obispo.

Crookston School of Agriculture. W. Robertson (*Minn. Farm Rev., 1½ (1908), No. 9, pp. 164, 165, fig. 1*).—A description of the buildings and work of this institution.

For the promotion of the culture and uses of fruit (*Ber. Landw. Reichsamte Innern [Germany], No. 6, pp. VI+177*).—This is a report of the German Pomological Society on courses of instruction for fruit experts, one of which was held in Dresden on September 10 and 11, 1906, and the other in Lübeck, July 29–31, 1907, and on courses for fruit packing.

School gardening in the province of La Union. N. H. Foreman (*Philippine Agr. Rev. [English ed.], 1 (1908), No. 2, pp. 95–99, pl. 1*).—This extract from the report of the author, who is supervising teacher at Lubao-Aringay, gives a brief account of the school garden work in the province of La Union. Every school has a garden in which instruction is given in the use of fertilizers, cultivation of plants, use of products, and the saving of seeds. The success of the work is attributed largely to the fact that each pupil was given his own individual plat, thus giving him definite ownership and a right to use or sell the products of his garden.

Boys' corn growing contest. S. M. Jordan (*Mo. Bd. Agr. Mo. Bul., 6 (1908), No. 4, pp. 9, figs. 6*).—Announcement of prizes offered, rules governing the contest, and of boys' and young men's short courses, and directions for planting, cultivation, etc.

With a prosperity train in Georgia. S. M. Ball (*World's Work, 16 (1908), No. 3, pp. 10445–10453, figs. 8*).—This is an account of the six-weeks run in the winter of 1908, of a special train manned by the Georgia College of Agriculture.

The farmers' institutes in the United States, 1907. J. Hamilton (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 307–354*).—This is the annual report of the Farmers' Institute Specialist of this Office for 1907. It includes a discussion of the progress and problems of the institute movement, an account of the annual meeting of the American Association of Farmers' Institute Workers, a discussion of the agricultural education extension movement, and detailed reports and statistics on farmers' institutes in the different States and Territories.

Agricultural education through rural schools, E. D. Sanderson (*N. H. Col. School Bul. 1, pp. 20, figs. 7*).—A discussion of the purposes and possibilities of instruction in agriculture in high schools and in rural elementary schools, with special application to the schools of New Hampshire.

The need of technical education in our public schools, W. D. Gibbs (*Ann. Rpt. N. H. Hort. Soc., 1 (1907), pp. 104–108*).—This subject is discussed from the New Hampshire point of view with reference to the teaching of agriculture, manual arts, and home economics in the public schools, and the organization of special secondary schools to give instruction primarily in these subjects.

Agricultural education in the schools, K. L. Butterfield (*Trans. Mass. Hort. Soc., 1908, 1, pp. 111–121*).—Vocational training is discussed, likewise the question whether agriculture shall be introduced into existing schools or await the establishment of special agricultural schools. The author believes that agriculture should be put into the regular work of existing schools and that separate schools should be established wherever they can be maintained.

The rural school and its relation to the community and agriculture, K. L. Butterfield (*New England Farmer, 87 (1908), No. 40, p. 8*).—An abstract of a lecture dealing with ways in which the rural school may more completely serve the community interests. Some of the ways suggested are to enlist the support of the community, relate the school system to the industry of the community, develop the spirit of social service within the schools, relate the school more completely to the intellectual life of the community, and let the teacher become a community leader.

Elementary principles of agriculture, A. M. Ferguson and L. L. Lewis (*Sherman, Tex., 1908, pp. XV+304, figs. 179*).—This text-book is intended by the authors for use in the common schools. The authors deal with agriculture as a three-phase subject—a business, a science, and an art or craft. They approach it from the botanical side, dealing first with the morphology and physiology of plants in an elementary way, then with plants in relation to soils and moisture, and following with such matters as rotation of crops, propagation of plants, pruning and training of plants, and fungus diseases, insects, and birds in their relations to plants.

Several chapters of the text-book are devoted to animal husbandry—types and breeds of cattle, horses, hogs, sheep, goats, and poultry, the nutrition of the animal body, and farm dairying—and several chapters to special topics, such as home grounds, school gardens, forestry, and farm machinery. There is, however, no discussion of the leading farm crops of the Southwest. An appendix contains lists of books on agriculture, formulas for insecticides and fungicides, tables relating to the composition of American feeding stuffs, the digestible nutrients and fertilizing constituents in stock feeds, feeding rations, and a glossary and index.

Plowing and harrowing, C. L. Goodrich (*Hampton Leaflets, n. ser., 4 (1908), No. 10, pp. 17, figs. 12*).—An elementary study of plows followed by information concerning the reasons for plowing, when and how to plow, and similar matter concerning harrows and harrowing.

Soil studies, F. W. Taylor (*N. H. Col. School Bul. 2, pp. 22–44, figs. 14*).—An outline suitable for the guidance of teachers of rural schools is followed by simple and easily performed exercises and experiments with soils for use in the grammar grades. A list of reference books and pamphlets is appended.

Seeds and seedlings, C. Brooks (*N. H. Col. School Bul. 3, pp. 47–59, figs. 9*).—Suggestions are given for studies of seeds, germination, and the early development of the seedling.

What trees do, W. R. Lazenby (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1908), No. 2, pp. 12, figs. 12*).—This bulletin explains the various functions performed by trees.

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1907 (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1907, pp. 414, figs. 40*).—This includes the usual report on the work and expenditures of this Office for the fiscal year ended June 30, 1907, and the agricultural experiment stations in the United States, including Alaska, Hawaii, and Porto Rico; statistics of the land-grant colleges and experiment stations for 1907; a brief account of the twenty-first annual convention of the Association of American Agricultural Colleges and Experiment Stations; a report of the superintendent of the agricultural experiment station in Guam; and several articles and reviews abstracted elsewhere in this issue.

Annual Report of Nevada Station, 1907 (*Nevada Sta. Bul. 63, pp. 57*).—This contains the organization list, and reports of the board of control, the director, and heads of departments. The report of the director includes a financial statement for the fiscal year ended June 30, 1907. The experimental work reported in the departmental reports is abstracted elsewhere in this issue.

Bulletins of Alabama College Station (*Alabama College Sta. Indexes to Vol. XIV, Buls. 135–138, and Ann. Rpt. 1906, pp. 109–112; Vol. XV, Buls. 139–141, and Ann. Rpt. 1907, pp. 189–192*).—Indexes are given to the publications issued from January to December, 1906, and from January to December, 1907, together with a list of bulletins available June, 1908.

Index to papers relating to plant-industry subjects in the Yearbooks of the United States Department of Agriculture, J. E. Rockwell (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 17, pp. 55*).

Classified list of available publications of the Bureau of Animal Industry (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 134, pp. 8*).—A classified list of the publications of the Bureau available for distribution September 1, 1908.

A primer of conservation, T. Cleveland, Jr. (*U. S. Dept. Agr., Forest Serv. Circ. 157, pp. 24*).—This contains excerpts from addresses given at the White House Conference of Governors, May 13–15, 1908, a discussion of the significance of the conference, the declaration of principles adopted, brief statements by men prominent in national affairs upon the subject of conservation, and the letter of the President appointing the National Conservation Commission.

Declaration of Governors for conservation of natural resources (*U. S. Dept. Agr., Farmers' Bul. 340, pp. 7*).—This contains the declarations of principles adopted at the conference referred to above.

NOTES.

Delaware College and Station.—A science club with weekly meetings has been organized among the members of the agricultural department of the college and the station staff.

Georgia College.—A farmers' congress and a farmers' wives' congress were held at the college January 18–23. The dedication of the new agricultural building was a feature of the exercises of the week.

Guam Station.—The first two loads of improved agricultural tools and implements, most of which were entirely new to the agriculture of the island, have been received. It is planned to take up experiments with field and sweet corn, tobacco and coffee, and as to the use of leguminous trees and plants. A collection of the mealy bugs threatening the cocoanut industry is being made. To bring the station closely into contact with the farmers from the start a circular letter of inquiry has been distributed, in which suggestions are invited as to the lines along which improvement in agricultural conditions is most essential.

Iowa College.—James A. King, assistant in farm crops in the agricultural extension work, has resigned to engage in commercial work.

Kansas College.—P. J. Newman has been appointed assistant in chemistry.

Massachusetts Station.—James T. Howard has been appointed inspector in both the fertilizer and feed and dairy division of the chemical department, vice W. K. Hepburn, resigned.

Michigan College.—The enrollment of short-course students reached 204, making the total enrollment of the college 1,364, and taxing the present accommodations to the utmost.

Nebraska University and Station.—The short winter course in the school of agriculture closed with an excursion to the South Omaha Stock Yards. Special facilities were available for the inspection and judging of the different types of cattle, and this was followed by a demonstration in cutting beef, pork, and mutton.

T. A. Kiesselbach has been appointed adjunct professor of agronomy in the department of field crops, and Erwin Hopt has been appointed assistant in that department.

Cornell University and Station.—M. V. Slingerland, assistant professor of economic entomology in the college of agriculture, and entomologist in the station, died March 10 at the age of 44 years. Professor Slingerland was graduated from Cornell in 1892 and had been associated with the entomological work of the institution since 1890. He was the author of an unusually large number of bulletins and other articles on entomological subjects, and served as president of the Association of Economic Entomolgists in 1903.

Ohio Station.—Ralph E. Caldwell has been appointed assistant in animal husbandry.

Oklahoma College and Station.—John A. Craig, formerly director of the Texas Station, has been appointed director of the station and has entered upon his duties. According to *Breeders' Gazette*, H. P. Miller has accepted the principalship of the short courses in agriculture and domestic economy.

Oregon College and Station.—Alfred G. Lunn has been appointed assistant in the department of poultry husbandry.

Porto Rico Station.—William Hess, formerly gardener of the Florida Station, has been appointed expert gardener and has entered upon his duties.

Rhode Island Station.—Through the efforts of the station there has been organized in the State an agricultural experimental union. Each member agrees to conduct one simple experiment on his farm during the summer, and the results will be presented at an experience meeting to be held the following winter. Little interest was manifested when the subject was first broached, but the movement is now growing rapidly and is expected to result in a large and promising organization.

The vacancy caused by the resignation of J. S. Irish, assistant biologist, has been filled by the appointment of R. C. Waite, a graduate of the Michigan College.

Vermont Station.—Joseph W. Wellington has been appointed assistant horticulturist.

Washington College and Station.—Ira P. Whitney has resigned as instructor in dairying and dairy expert to assume charge of a large dairy farm in Montana. C. C. Thom, demonstrator in physics at the Ontario Agricultural College and Experimental Farm, has been elected soil physicist of the station, vice H. B. Berry, who has been appointed instructor in agronomy. Alex Carlyle has been appointed assistant cerealist of the station and entered upon his duties February 15.

Wisconsin University.—A tuberculosis exhibit consisting of the State exhibit at the International Congress on Tuberculosis, together with reproductions of the principal features of other exhibits at that congress, has been prepared by the department of bacteriology and the State antituberculosis association and is to be sent out to cities in the State by the university extension division.

The annual convention of the State board of agriculture was for the first time held at the college of agriculture, the meetings taking place February 3 and 4. A number of State live stock associations also met at the time. The speakers included several members of the staff of the college and station, as well as of other institutions.

The enrollment in the short courses reached 444, a gain of 51 over the previous year. Nearly every county of the State was represented, besides 8 other States, England, Japan, India, and Panama. At special exercises held February 13 in connection with the short courses, President Van Hise, on behalf of the university, presented to Charles P. Goodrich, a Jefferson County dairyman, Arthur L. Hatch, a Door County horticulturist, and Henry Wallace, of Iowa, editor of *Wallace's Farmer*, engrossed testimonials setting forth the appreciation by the university of their services to agriculture. This is believed to be the first formal recognition by educational institutions of the services to agriculture of private individuals.

First Pan-American Scientific Congress.—The following account of this congress is furnished by Mr. George M. Rommel, of the Bureau of Animal Industry of this Department, who was one of the delegates from the United States to the congress.

The first Pan-American Scientific Congress was held at Santiago, Chile, from December 25, 1908, to January 5, 1909. More than 200 delegates were present and every American republic except Haiti was represented. There had been held previously three scientific congresses at which the Latin-American republics were represented—at Buenos Ayres, Montevideo, and Rio de Janeiro. Shortly after the last of these congresses an invitation was extended to the United States to participate in the fourth congress, and the invitation was accepted, Congress appropriating $35,000 early in 1908 to be used by the Secretary of State in defraying the expenses of a delegation from this Government.

Ten delegates were appointed by Secretary Root, seven being university professors, and the remainder government officers. The delegation was composed as follows: Prof. L. S. Rowe, University of Pennsylvania, chairman; Prof. Paul S. Reinsch, University of Wisconsin, vice-chairman; Prof. Hiram Bingham, Yale University; Prof. A. C. Coolidge, Harvard University; Col. W. C. Gorgas, U. S. Army; Prof. W. H. Holmes, Smithsonian Institution; Prof. Bernard Moses, University of California; Mr. Geo. M. Rommel, U. S. Department of Agriculture; Prof. W. R. Shepherd, Columbia University; and Prof. W. B. Smith, Tulane University. The university men on the government delegation also represented their respective universities, and the following educational institutions sent delegates direct or were represented by alumni residents in South America: Chicago, Cornell, Harvard, Illinois, Michigan, Minnesota, and Northwestern universities. The National Education Association and the Association of American Universities were likewise represented.

The congress attracted a great deal of interest throughout South America, and wherever the delegates went they were received with marked attention. In Chile itself the government and the public vied with each other in providing entertainment, while the press paid an unusual amount of attention to the proceedings, publishing entire the official reports of each section.

The congress was divided into the following sections: I, Pure and applied mathematics; II, physics and chemistry; III, natural sciences, anthropology, and ethnology; IV, engineering; V, medicine and hygiene; VI, jurisprudence; VII, social science; VIII, pedagogy; and IX, agronomy and zootechnics. The attendance was largest in the sections on medicine and hygiene, social science, and pedagogy. In the section on agronomy and zootechnics, the attendance was small but representative. The greater part of the time of this section was taken up with discussions of agricultural education, and the fact is of the highest importance as showing the interest which our southern neighbors have in the training of young men to become expert farmers and stockmen or to engage in research work in agricultural science.

The trend of discussion in this section can be best shown by quoting verbatim the resolutions on agricultural education presented by the section to the congress. They were as follows:

Agricultural education for its development should be divided into three grades; superior, secondary, and practical-elementary.

A. Superior agricultural education.—The section of agronomy and zootechnics declares that it regards as indispensable that the American countries which have not already done so give to superior education in agriculture the character of university instruction.

To this end a faculty of agronomy should be established with due provision that the institutions which give this instruction are supplied with the necessary laboratories and are located on property of their own, in which said instruction can be amply applied and demonstrated.

B. Secondary education.—The instruction of a secondary character should be theoretical and practical, and should be distinguished by its local character, confining especially the work done to the branches of agriculture peculiar to the region in which they are situated, and developing the teaching of them under a local management. The institutions which give this instruction should be established on farm properties of sufficient extent, conveniently located, and adapted to an economical development so as to train agriculturists and specialists capable of directing work on a rural establishment.

C. Practical-elementary education.—The practical-elementary education should be local and made specific in certain branches of agronomic science best suited to local application, developing the work in detail and supplying the proper ex-

planation as each act is performed, in all the operations which deal with the planting, development, and management of a farm property of the kind and importance which the school should have in mind.

D. In order to complete agricultural education, the American countries should keep in view: (1) Supplementary establishments for agricultural and experimental development such as agricultural experiment stations, laboratories of vegetable pathology and vitology, special stations, agricultural statistics, etc.; (2) the development of extension teaching through the medium of demonstration farms, by the aid of local farmers, and, in general, by all the means of propaganda which enable agricultural instruction to reach the farmer himself so as to guide him in his work.

E. The secondary and practical-elementary agricultural instruction, as well as the different activities involved in official agricultural propaganda, should be organized systematically in accordance with the needs of the country, and should be placed in charge of the executive power, for the attainment of which purpose the government should possess a central administrative mechanism, capable of regulating the system and controlling its results; a ministry of agriculture, with its dependencies, being the most efficacious of all.

F. In order to awaken and stimulate a desire for agricultural study, the section of agronomy and zootechnics believes: (1) That the primary schools in the country, and even in cities in agricultural districts, should include compulsory agricultural education as an integral part of their course of study; (2) that in the courses of study in normal schools, instruction in theoretical and applied agriculture should be included, in order to render teachers capable of giving such instruction in the primary schools.

The thought of the South Americans on this matter is readily seen to be similar to that of North Americans, and while the importance of agricultural education is not yet so fully recognized as in the United States, nor the schools now established so well equipped, the foundations are being laid for excellent work.

In research work, comparatively few papers were presented, but some interesting ones were read on veterinary science and zootechnics, horticulture, soils, and plant pathology. Experiment stations are not numerous in South America, but those which are established, as for example, at São Paulo in Brazil, at Santa Catalina in Argentina, and at Santiago in Chile, appear to be doing good work, especially in agronomy.

The action of the congress in selecting Washington as the meeting place for the second Pan-American Scientific Congress is of great interest to North Americans, and our experiment station men will then have an unequaled opportunity to become acquainted with the agricultural leaders of South America. The congress will be held during the year 1912, the exact date being left to the organization committee, which as appointed by the Santiago congress is as follows: Prof. L. S. Rowe, University of Pennsylvania, chairman; Hon. John Barrett, Director Bureau of American Republics; Hon. E. E. Brown, U. S. Commissioner of Education; Prof. W. H. Holmes, Chief Bureau of Ethnology, Smithsonian Institution; and Mr. Geo. M. Rommel, Bureau of Animal Industry of this Department.

Seventh International Congress of Applied Chemistry.—This body is to meet in London May 27 to June 2. The congress will be organized into sections of analytical chemistry, inorganic chemistry, metallurgy and mining, explosives, organic chemistry and allied industries, industry and chemistry of sugar, starch industry, agricultural chemistry, hygiene, medical and pharmaceutical chemistry, bromatology, photographic chemistry, electrical and physical chemistry, and law, political economics and legislation with reference to chemical

industries. Dr. H. W. Wiley of this Department is chairman of the American committee, and its section on agricultural chemistry is composed of C. G. Hopkins, chairman, R. J. Davidson, J. G. Lipman, F. T. Shutt, and J. T. Willard. F. P. Veitch and P. H. Walker are among the members of the section on analytical chemistry, A. S. Cushman that of inorganic chemistry, A. H. Bryan that of the industry and chemistry of sugar, and M. E. Jaffa that of the subsection on hygiene and medical chemistry. The subsection on bromatology is made up of W. D. Bigelow, chairman, E. M. Chamot, C. F. Langworthy, Graham Lusk, and W. W. Skinner.

Fourth International Congress of Dairying.—The committee in charge of this body announces that it will meet at Budapest, June 6–10, 1909. The congress will be organized in sections of dairy industries, dairy machinery and apparatus, and scientific exhibits and methods of experimentation. Additional information may be obtained from the Deutschen Milchwirtschaftlichen Vereins, Friedenau, Friedrich-Wilhelm—Platz 2.

British Association for the Advancement of Science.—This organization is to meet at Winnipeg, Manitoba, August 25 to September 1. Maj. P. G. Craigie is to act as chairman of the subsection on agriculture.

Opening of Wisley Laboratories.—A laboratory and research station at the Wisley Gardens, Surrey, has recently been opened under the management of the Royal Horticultural Society. A one-story building, fitted up with a students' laboratory, a small research laboratory, a photographic room, and a small glass annex for experiments in plant physiology and pathology has been erected, together with a range of greenhouses, the total cost being about $8,000. F. J. Chittenden has been appointed director.

Agricultural Work in Portuguese East Africa.—E. C. Heron, formerly engaged in experimental work in Australia and the Transvaal, has been appointed bacteriologist in the department of agriculture of Portuguese East Africa, and T. R. Sim, ex-conservator of forests of Natal, has been temporarily engaged to study the forests of the Inhambane and Zambesi districts. Laws have recently been enacted regulating the importation of plants and animals, and measures are in operation in the southern half of the country for the eradication of the cattle diseases which have seriously restricted the agricultural development of the region.

Italian Colleges of Agriculture.—A recent number of *Cornell Countryman* contains an interesting interview with Professor John Craig, in which he describes the five colleges of agriculture in Italy, located respectively at Portici, near Naples, Perugia, Pisa, Bologna, and Milan. Two of these institutions are under the direction of the State Department of Public Instruction and three under the Department of Agriculture. The entrance requirements to the colleges of agriculture are the same as to the universities. The enrollment of students is relatively small, not more than 150 students being in attendance at any institution. These students belong to two classes, the sons of landholders who wish to prepare themselves to manage their estates and those who are preparing to teach agriculture.

New Agricultural School in Venezuela.—The President of the State of Zulia has authorized the establishment of the first school of agriculture in the State to be located at Maracaibo. It will receive an appropriation of about $78 a month and be under the supervision of the Association for the Improvement of Agriculture and Live Stock.

A Home and Colonial Training School for Women.—*Farm Life* for January 2, 1909, contains a description of the equipment and course of study of Arlesey College, Bedfordshire, England, which was opened at the beginning of 1908, with Miss Turner as principal. The full course of training extends over two

years, and includes housework in all its branches, the care of bees, pigs, and poultry, and simple gardening. During the first six months of the course students do the cooking the first week, the housework the second, and the third they go into the garden. Then they can go outside and specialize or work in the house entirely. Not more than 8 students, between the ages of 18 and 30, are received for training at one time.

Withdrawal of Phosphate Lands from Entry.—Following an estimate at a recent meeting of the National Conservation Commission by the Geological Survey that at the present rate of production the known available supply of high-grade phosphate rock will last only about 50 years longer, about 7,500 square miles of public lands in Wyoming, Idaho, and Utah believed to contain phosphate deposits were on December 10 withdrawn from entry by the Secretary of the Interior. It is expected that a further examination of these lands will be undertaken by the Geological Survey as soon as possible, looking toward their careful classification and the restoration to agricultural entry of such portions as are found to contain no phosphates.

New Journals.—*The Porto Rico Horticultural News* is being issued as the official organ of the Porto Rico Horticultural Society. Among the associate editors is D. W. May, Director of the Porto Rico Station, and a recent number includes articles by M. J. Iorns and H. C. Henricksen of the station staff.

Boletin de la Union Agricola de Chiapas has been established as the monthly official organ of the Agricultural Union of Chiapas, Mexico.

The initial number of *Mitteilungen des Kaiser Wilhelms Instituts für Landwirtschaft in Bromberg* has been issued and contains an extended report by the plant pathologist of the institute on plant diseases and insect pests in Posen and West Prussia during 1907, together with several shorter communications. It is expected to issue from 4 to 6 numbers of the publication annually.

The Journal of Industrial and Engineering Chemistry is being published as a monthly by the American Chemical Society, with W. D. Richardson as editor. The initial number contains editorials, original articles and brief notes on topics of interest to industrial chemistry, quotations, book reviews, notes of the meetings of scientific societies, trade and industrial notes, and official regulations and rulings.

The Journal of Home Economics has been established as the organ of the American Home Economics Association with its secretary as editor. For the present five numbers a year are to be issued. The initial number contains an account of the formation and purpose of the association; a report of the proceedings of the first convention and of the meeting of the teaching section of the Lake Placid Conference which preceded it; papers on Cost of Board on Minnesota Farms, by T. P. Cooper; Domestic Art Subject-Matter for Secondary Schools, by Anna M. Cooley; Training of Dietitians for Hospitals, by Florence R. Corbett; The Dietitian in Tubercular Sanitoria, by H. M. King; and The Visiting Dietitian, by W. S. Gibbs; notes on illustrative material for domestic science and on domestic-science teaching in New York City schools; brief reviews of books and other literature; miscellaneous notes; the constitution of the association; and a list of the original members.

The Pacific Rural Press of December 19, 1908, announces the opening early in December of the Imperial Valley Collegiate Institute at Heber, Cal. Agriculture is to be one of the prominent departments of the Institute and has been placed in charge of Charles J. Booth, a 1908 graduate of the California University.

Abstracts of English Experimental Work in Agriculture.—Beginning with the September number, the *Journal of the Board of Agriculture* is including each month brief summaries of experimental work recently reported by the agri-

cultural colleges, agricultural societies, and other agricultural research organizations of England, Scotland, and Wales. It is planned to group these abstracts so far as possible by subjects, the September number reporting experiments with cereals and the October number experiments conducted during the last 2 years with root crops.

Chemiker Zeitung.—Attention is called to the fact that beginning with the thirty-third year, this journal of scientific, industrial, and commercial chemistry will be issued three times a week instead of semiweekly as heretofore. This has been rendered necessary by the rapid accumulation of information bearing upon the relation of science to industry, no small feature of which, as shown by the pages of the *Chemiker Zeitung*, is due to the application of chemical science to agriculture.

Miscellaneous.—Dr. G. Karsten, custodian of the Botanic Garden at Bonn, has been chosen as successor to the late Dr. F. Noll, Director of the Botanic Garden and Institute of Halle.

About 1,200 persons attended the lectures and discussions offered during farmers' week, January 25–30, at the St. Lawrence School of Agriculture, Canton, N. Y.

The Tenth International Conference of Sheep Breeders will be held June 21 in Gloucester, England. The subject for discussion, How Can We Improve the Sheep Industry? will be opened by George McKerrow, of Wisconsin.

The New York Botanical Garden has begun the issuing of a mycological journal to which the name *Mycologia* is given, volume 1, No. 1 appearing in January, 1909. It is issued under the editorship of W. A. Murrill, with a staff of associate editors, and is in continuation of the *Journal of Mycology*, published by the late Dr. W. A. Kellerman. The first number contains papers on Illustrations of Fungi, The Boletaceæ of North America, Notes on North American Hypocreales, A Bacterial Disease of the Peach, and The Problems of North American Lichenology.

Sir Daniel Morris, who retired from the office of Commissioner of the Imperial Department of Agriculture for the West Indies on November 30, 1908, has been appointed to the newly created office of scientific adviser to the Secretary of State for the Colonies in matters pertaining to agriculture in the British tropical possessions. Sir Daniel Morris organized the Department of Agriculture of the West Indies in 1898, utilizing for this purpose the various educational agencies already in existence in the islands, but also introducing and training a number of young university science graduates in the work of the department. Among the most notable of the achievements of the department under his administration were the inauguration and holding of annual or biennial conferences and the reestablishment of the cotton industry, which had almost been extinct in the West Indies for about 100 years. The honor of knighthood was conferred upon him in 1903 in recognition of his valuable services as commissioner of agriculture.

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METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

EXPERIMENT STATION RECORD.

VOL. XX. MARCH, 1909. No. 8.

With the rapid extension and development of research agencies in agricultural experimentation there has come about a remarkable increase in both the number and the importance of the publications to be reviewed. Thus, during the last fiscal year the scientific publications of the State experiment stations and this Department alone increased 10 per cent in number. It is believed that there has been a corresponding increase in agricultural literature from other sources, and in addition the adoption by the Office of methods whereby there has been a more systematic examination of the foreign literature has tended to bring to light a number of articles of value from obscure sources not hitherto accessible. The abstracts of the literature have thus rapidly accumulated, while at the same time various circumstances have operated to delay their publication.

In order to provide for the publication of this accumulated material it is proposed to include in the current volume (XX) of the Record two numbers composed almost wholly of abstracts. The present number (No. 8) is the first of these abstract numbers. The second will probably be issued about the close of the present fiscal year and will constitute No. 12 of the current volume. This will terminate the volume, thereby securing conformity with the fiscal year instead of closing with the August number as heretofore.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

A short and accurate method for the estimation of iron, alumina, and phosphoric acid when occurring together, T. Cooksey (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 163–171; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 533, II, pp. 987, 988*).—A combination of well-known volumetric methods is employed as follows:

"To the solution, which must be sufficiently acid to produce a yellow color and not a reddish one with the iron present, is added a definite quantity of a standard solution of sodic dihydric phosphate. In case the original solution is too strongly acid, this can be partially neutralized by caustic potash or by evaporation; and it is convenient to work with 20 or 30 cc. of solution containing not more than 0.1 gm. of the mixed oxids. With this amount of liquid, the precipitation can be conveniently carried out in a 100 cc. flask. Caustic potash of decinormal strength is gradually run in under constant shaking until the pink tint with methyl orange has just disappeared. The volume is made up to 80 or 90 cc. and warmed for a short time on the water bath. This heating causes the precipitate to coagulate and quickly settle. The precipitate is now filtered off and well washed with hot water until the filtrate gives no cloudiness with silver nitrate when tested for chlorids, assuming them to be present. A few more washings after this stage is arrived at, thoroughly stirring up the precipitate on the filter, are then sufficient. The filtrate and washings together will then make 200 or 250 cc. Calcium chlorid in excess is added, the whole made slightly acid to methyl orange by a few drops of decinormal hydrochloric or sulphuric acid, and boiled to get rid of any carbonic acid. The procedure is the same as that previously described. The precipitated phosphates are dried, and can be removed from filter paper, the latter burnt off in platinum crucible at low temperature and the remainder of precipitate added. The whole is then heated by Bunsen burner to constant weight. It is perhaps advisable not to raise to too high a temperature. The iron can be separately estimated either in the original solution or by dissolving up the phosphates with a few drops of strong hydrochloric acid and making use of the iodin and thiosulphate method.

"We have now the weight of the total iron and aluminum phosphates, the amount of iron, and the amount of phosphate left in solution. The amount of iron phosphate corresponding to the oxid of iron found, is subtracted from the total weight of phosphates, the difference gives the aluminum phosphate. By subtracting the known quantity of phosphoric acid added from the sum of the three amounts of phosphoric acid found, that is, that combined with the iron, that combined with the alumina, and the amount left in filtrate, we obtain the original phosphoric acid in solution."

Qualitative analysis of phosphates and other salts soluble in acid media, H. Caron and D. Raquet (*Ann. Chim. Analyt., 13 (1908), No. 10, pp. 373–378*).—A systematic plan of procedure is described.

The determination of phosphoric acid by the Pemberton method, G. H. G. LAGERS (*Ztschr. Analyt. Chem., 47 (1908), No. 9–10, pp. 561–571; abs. in Chem. Zentbl., 1908, II, No. 16, pp. 1379, 1380*).—Comparisons of the gravimetric method with the original Pemberton method and the Pemberton method modified by the addition of about 0.58 mg. of sulphuric acid are reported. The unmodified method gave uniformly high results. The modification gave results closely agreeing with those obtained by gravimetric analysis.

The direct determination of phosphoric acid as ammonium phosphomolybdate, E. RABEN (*Ztschr. Analyt. Chem., 47 (1908), No. 9–10, p. 546; abs. in Chem. Zentbl., 1908, II, No. 16, p. 1379; Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 896; Chem. Ztg., 32 (1908), No. 97, Repert., p. 630*).—Results are reported which show that phosphoric acid may be quite accurately determined by precipitating with ammonium molybdate according to Woy's method, removing the ammonium nitrate by washing a few times with warm 70 per cent alcohol, once with strong alcohol, and finally with a few cubic centimeters of ether, and weighing the dried precipitate.

The quick colorimetric determination of small amounts of water-soluble phosphoric acid, I. POUGET and D. CHOUCHAK (*Bul. Soc. Chim. France, 4. ser., 5 (1909), No. 3, pp. 104–109; Chem. Ztg., 32 (1908), No. 70, p. 832; abs. in Analyst, 33 (1908), No. 392, p. 441*).—The method is based upon the intensity of cloudiness produced in nitric acid (7 to 8 per cent) solution of phosphates by the addition of strychnin of known strength.

Titration of phosphoric acid in the presence of chlorids, V. BOULEZ (*Chem. Ztg., 32 (1908), No. 67, p. 796; abs. in Chem. Abs., 2 (1908), No. 21, p. 2917*).—The author claims priority for discovery of a volumetric method for the determination of phosphoric acid in the presence of strong alcohol and chlorids.

A simple method of determining caustic lime, M. PÖPEL (*Ztschr. Angew. Chem., 21 (1908), No. 40, p. 2080; abs. in Chem. Ztg., 32 (1908), No. 89, Repert., p. 573*).—A method based on distillation with ammonium chlorid, collection in acid of the ammonia driven off, and titration is recommended. After the air is driven off carbon dioxid may be determined in the residue by adding hydrochloric acid.

On the determination of caustic lime, R. NOWICKI (*Ztschr. Angew. Chem., 21 (1908), No. 45, p. 2318*).—It is pointed out that the method proposed by Pöpel and noted above is inaccurate because it is based upon the assumption of the indifference of calcium carbonate to ammonium chlorid solution, whereas a very large proportion of the ammonia in ammonium chlorid is shown by the author's experiments to be driven off when the latter is boiled with calcium carbonate.

Methods of water analysis, J. H. BREWSTER (*Municipal Engin., 35 (1908), No. 3, pp. 162–167*).—This paper explains briefly the possibilities and limitations of analysis and sanitary survey in judging of the sanitary quality of waters, and indicates the most reliable methods which have been proposed for this purpose.

The determination of oxygen consumed in waters, E. M. CHAMOT (*Amer. Jour. Pub. Hyg., 18 (1903), No. 3, pp. 280–284*).—The procedure used in the laboratory of sanitary chemistry of Cornell University is described as follows:

"Two hundred cubic centimeters of the sample are placed in a 400 cc. Erlenmeyer flask; 10 cc. of dilute sulphuric acid (1:4) added and from a burette standard potassium permanganate (1 cc.=0.0001 gm. available oxygen) introduced very slowly, drop by drop. As soon as a permanent pink color results the burette reading is recorded, and the flask allowed to stand a few minutes so as to note whether decolorization will take place. The standard permanganate is again added until the total volume introduced is equal to 10 cc.; the

flask is then placed over a Bunsen or ring burner (best if heated over the free flame) and brought as rapidly as possible to a boil. The boiling is continued for exactly five minutes, the flask removed, allowed to stand for one minute, the excess of permanganate carefully destroyed by standard oxalic acid solution (1 cc.=1 cc. permanganate) and the permanganate again added until a trace of pink appears and persists for one minute. From the total volume of permanganate the volume of oxalic acid used is deducted.

"In order that the results obtained may always be comparable an excess of at least 2 cc. must at all times remain."

Examinations of a large number of samples of water by this method indicate that oxygen consumption is of little value in judging highly colored surface waters. With ground waters which are colorless or nearly so there appears to be a somewhat close relation between high oxygen consumed and high bacterial flora and vice versa. Five minutes' boiling is thought to be sufficient to decompose all easily oxidizable organic matter, and this is believed to be all that is necessary to determine in such analysis.

New methods of analysis (*Mem. Dir. Fomento [Peru], 1907–8, vol. 1, pp. 80–88*).—Methods used in the analysis of guanos and soils are briefly described.

Further notes on humus acids, A. J. Van Schermbeek (*Jour. Prakt. Chem., n. ser., 78 (1908), No. 17–18, pp. 285–288*).—The author reiterates his criticisms of the Tacke-Süchting method (E. S. R., 20, p. 308).

The isolation of dihydroxystearic acid from soils, O. Schreiner and E. C. Shorey (*Jour. Amer. Chem. Soc., 30 (1908), No. 10, pp. 1599–1607, pl. 1*).—The methods employed in isolating this body are described and tests of its toxicity in experiments with wheat seedlings are reported. It was found that the toxicity of the substance was "as great in a concentration of 100 parts per million as in a concentration of 200 parts per million, which is approximately a saturated solution, and the toxic effect is marked even when the concentration is as low as 20 parts per million."

Organic chemistry for advanced students, J. B. Cohen (*New York and London, 1907, pp. VIII+632*).—Chemical theories and other related topics are discussed in this volume. Special interest for students of nutrition attaches to the chapters on carbohydrates, fermentation and enzym action, the purin group, and the proteids, which summarize the more important work which has been done and the theories at present held.

Physiological chemistry, W. D. Halliburton (*Ann. Rpts. Prog. Chem. [London], 4 (1907), pp. 226–260*).—A critical summary and review of investigations reported on the chemistry of proteids and other questions of physiological chemistry.

Hydrolysis of vicilin from the pea, T. B. Osborne and F. W. Heyl (*Jour. Biol. Chem., 5 (1908), No. 2–3, pp. 187–195*).—The results of hydrolysis of vicilin are very similar to those obtained with legumin, the most marked difference being that vicilin yielded no glycocoll. Less alanin and arginin and more glutaminic acid were also found than in legumin. "It is probable that vicilin is a distinct protein or mixture of proteins and not an altered product of legumin, for the seeds of the vetch which contain legumin yield no vicilin."

Hydrolysis of legumelin from the pea, T. B. Osborne and F. W. Heyl (*Jour. Biol. Chem., 5 (1908), No. 2–3, pp. 197–205*).—The products obtained by the hydrolysis of legumelin from the pea (*Pisum sativum*) were studied in comparison with other pea proteids and leucosin of wheat.

"The results of this hydrolysis show legumelin to be distinctly different in constitution from the other proteins with which it is associated in the pea. The properties and ultimate composition of legumelin closely resemble those of leucosin from the wheat embryo, and this resemblance extends not only to the

general proportion of the several amino-acids, but also to the total quantity obtained from each of these albumins. . . .

"It is not improbable that legumelin is a constituent of the physiologically active tissues of the seed, rather than a reserve food substance for the developing seedling.

"This supposition in regard to leucosin is supported by the fact that this albumin is located almost entirely in the embryo of the seed and that it resembles more closely, both in properties and composition, the proteins of physiologically active tissues of animals, than those which unquestionably form the reserve food protein of the endosperm of other seeds.

"As the leguminous seeds do not contain a sharply differentiated embryo and endosperm, but are composed of tissues which combine the functions of both, it is not possible to locate any one of their proteins in any particular part of these seeds. The just-mentioned similarity, however, of legumelin to leucosin is suggestive of similarity also in their physiological functions."

On the influence of temperature upon the solubility of casein in alkaline solutions, T. B. Robertson (*Jour. Biol. Chem., 5 (1908), No. 2–3, pp. 147–154*).—The author has continued his researches on the chemical properties of casein (E. S. R., 18, p. 873).

"The solubility of the casein in alkaline solutions is considerably augmented by carrying out the process of solution at temperatures above 40° C.

"It is pointed out that this fact is not in harmony with the view that a rise in temperature increases the degree of hydrolytic dissociation of solutions of the caseinates.

"In explanation of this fact and of the increase in alkalinity and electrical conductivity of caseinate solutions upon heating, which were observed by Osborne, it is suggested that the influence of heat upon proteins consists, among other effects, in shifting equilibria of the type: $HXOH+HXOH \rightleftarrows HXXOH+H_2O$ in the direction of higher complexes, and that heat coagulation is a result of repeated condensations of this type.

"The solubility of casein in solutions of various concentrations of potassium hydroxid, lithium hydroxid, and calcium hydroxid at various temperatures has been determined."

The establishment of the equivalent weight of casein and a new method for its estimation, G. T. Matthaiopoulos (*Ztschr. Analyt. Chem., 47 (1908), No. 8, pp. 492–501; abs. in Analyst, 33 (1908), No. 390, pp. 365, 366*).—The author's method is based on the fact that casein behaves like an acid toward phenolphthalein. Dilute sulphuric acid is added to milk until the casein is coagulated. The filtrate is titrated with sodium hydroxid and its amount compared with the amount required when the casein is not removed. Using this method the author has determined the equivalent weight of casein to be 1,131.5.

Medico-legal studies of starch by means of polarized light, M. Herman (*Bul. Soc. Chim. Belg., 22 (1908), No. 8–9, pp. 340–342*).—The author discusses the importance of this method of analysis.

The determination of pepsin with the report of a new method, E. Fuld and L. A. Levison (*Amer. Med., n. ser., 3 (1908), No. 2, p. 57–63*).—The titration method for estimating pepsin, which the authors propose, involves the use of a 1 per cent solution of edestin in dilute hydrochloric acid. The application of the method to problems of theoretical and practical interest is discussed and from the data presented the authors conclude that the method gives more satisfactory results than the older methods and is to be recommended for exact work.

The estimation of fat in dry milks, B. G. McLellan (*Analyst, 33 (1908), No. 390, pp. 353–356; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 18, p. 954*).—"The fat may be completely extracted by means of ethylic ether of specific gravity 0.720 if 5 gm. of the sample be placed in a cartridge in a Soxhlet apparatus, allowed to soak over night in the solvent, extracted during the whole of the next day, again soaked in the solvent over the following night, and extracted an hour or two the next day."

The estimation of fat in dry milks, H. Droop-Richmond (*Analyst, 33 (1908), No. 391, pp. 389, 390*).—A discussion of the Werner-Schmid and the Röse-Gottlieb methods. The author modifies both methods "by extracting the whole of the fat by successive treatment with solvents rather than to take an aliquot part for evaporation and weighing, as this avoids one source of error." The method is given in detail.

A new method for milk testing, W. M. Doherty (*Analyst, 33 (1908), No. 388, pp. 273–275*).—To see if any relation existed between the ash and other milk solids, the author compared the amount of phosphoric acid with the other solids. The phosphoric acid is fairly constant and does not follow proportionally the amount of solids-not-fat. "Beginning from the milk ash properly incinerated the phosphoric acid may be estimated in 10 minutes or even less. . . . In no case, using the phosphoric acid method, did actual watering escape detection. . . . It would appear that the phosphoric acid method is capable of indicating results nearer the truth than those obtained by the determination of the solids-not-fat."

The detection of watered milk by means of the refractometer, C. Mai and S. Rothenfusser (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 7–19; abs. in Rev. Gén. Lait, 7 (1908), No. 6, p. 138*).—This is a review of previous investigations and an account of the results obtained by the authors' use of Ackermann's method (E. S. R., 18, p. 811). From the examination of 5,000 samples the authors believe that the refractometer is a reliable instrument for detecting the adulteration of milk, and they have prepared a table by which the percentage of watering may be estimated from the amount of refraction. Normal milk has a refraction number of 39. If a sample is 36.5 or less it is proof of adulteration. Milk containing 50 per cent of water had a refraction number of 30.9. The percentage of fat does not affect the refractive power, neither does the addition of formaldehyde.

A simple colorimetric method for the determination of formalin in milk, E. W. T. Jones (*Chem. News, 98 (1908), No. 2556, p. 247; abs. in Analyst, 34 (1909), No. 394, pp. 22, 23*).—The author describes a method by which he has obtained satisfactory results. The operation can be performed in an hour or less, and requires only 10 cc. of milk. The reagent used is prepared from iron wire dissolved in hydrochloric acid, oxidized with nitric acid, and precipitated with ammonia.

The limits of experimental error in estimating the amount of moisture in butter, A. Schoonjans (*Bul. Soc. Chim. Belg., 22 (1908), No. 8–9, pp. 342–360*).—Since the maximum moisture content of butter is fixed by law in some countries a rapid and accurate method is an important consideration. The methods of Wauters (E. S. R., 18, p. 873) and other investigators, and also the official methods of European countries, are reviewed.

The author evaporated butter under different conditions. In a sample of butter placed in a paper-covered beaker and heated in an oven in boiling water, the moisture content was estimated at 16.81 per cent. In another sample of the same butter 18.15 per cent of moisture was obtained in an uncovered beaker heated in an oven in air at 115° C. This indicated that exact values were not attained.

The detection of benzoic acid in butter, G. Halphen (*Ann. Chim. Analyt., 13 (1908), No. 10, pp. 382–384; abs. in Analyst, 33 (1908), No. 392, p. 420*).—The author gives the details of a method for detecting benzoic acid in butter even when present in small quantities. It is based on the formation of ammonium diaminobenzoate, which gives a brownish red coloration in an alkaline solution.

The unsaponifiable constituents of cocoanut fat and its detection in admixture with butter, H. Matthes and E. Ackerman (*Ber. Deut. Chem. Gesell., 41 (1908), No. 10, pp. 2000, 2001; abs. in Analyst, 33 (1908), No. 390, p. 357*).—The authors have found that cocoanut fat contains in addition to ordinary phytosterol a second phytosterol. This gives similar color reactions but yields an acetate which combines with 2 molecules of bromin, forming a sparingly soluble tetrabromid which is characteristic. Cholesterol in butter does not form an acetate tetrabromid, hence this reaction is suggested as a direct method for detecting the presence of vegetable fat as an adulterant.

Microscopic examination of powdered cocoa and chocolate, E. Collin (*Jour. Pharm. et. Chim., 6. ser., 28 (1908), No. 7, pp. 295–303, fig. 1*).—The microscopic structure of the anatomical elements of cocoa and chocolate is discussed and illustrated with a view to facilitating the judging of the character of such goods by microscopic methods.

Detection of vegetable albumin in sausage, A. Beihe (*Ber. Chem. Untersuch. Amt. Chemnitz, 1907, p. 14; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 360*).—According to the analytical data reported vegetable proteid materials have characteristic forms and the presence of such material may be detected with the microscope.

The detection of plant protein in sausage, A. Schmid (*Jahresber. Thurgauischen Kanton. Lab., 1907, p. 7; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 360*).—The examination of a number of sorts of sausage did not indicate the presence of vegetable albumin.

The estimation of saltpeter in sausage meat and ham, H. Kreis (*Ber. Chem. Lab. Basel, 1907, pp. 20, 21; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 360*).—Analytical data are reported.

Normal occurrence of citric acid in wines, E. Dupont (*Ann. Chim. Analyt., 13 (1908), No. 9, pp. 338–343*).—A summary and discussion of the author's investigations on the occurrence of citric acid in wines.

The natural citric acid content of wines, E. Dupont (*Rev. Vit., 30 (1908), Nos. 765, pp. 173–177; 766, pp. 203–207*).—A report of the examination of a number of wines which showed the presence of citric acid in certain samples.

Citric acid in natural wines, M. H. Astruc (*Ann. Chim. Analyt., 13 (1908), No. 6, pp. 224–226*).—A contribution to the question of the natural occurrence of citric acid in wine.

Citric acid in natural wines, M. G. Deniges (*Ann. Chim. Analyt., 13 (1908), No. 6, pp. 226, 227*).—The author claims priority in the identification of citric acid as a constituent of certain wines.

New method for determining fixed and volatile acid in wine, M. E. Pozzi-Escot (*Bul. Soc. Chim. Belg., 22 (1908), Nos. 8–9, pp. 338–340*).—Noted from another source (E. S. R., 20, p. 612).

The indirect determination of the acidity of wine, G. Favrel (*Ann. Chim. Analyt., 13 (1908), No. 9, pp. 343–346*).—A study of methods.

The determination of succinic acid in wine and fermented liquors in the presence of fixed acids, M. E. Pozzi-Escot (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 3, pp. 185, 186; Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 14, pp. 600, 601; Ann. Chim. Analyt., 13 (1908), No. 11, pp. 439, 440; abs. in Chem. Zentbl., 1908, II, Nos. 10, p. 912; 18, p. 1541; Jour. Soc. Chem. Indus.,*

27 (1908), No. 21, p. 1078).—The author proposes a rapid method of estimating succinic acid by precipitation with bromid of barium after the other substances have been removed by various reagents.

Physicochemical analysis of wine, P. Dutoit and M. Duboux (*Ann. Chim. Analyt., 13 (1908), Nos. 11, pp. 417–427, figs. 5; 12, pp. 461–468, figs. 4; Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 2, pp. 134–137; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 16, p. 871*).—By adding a solution of barium hydroxid in small portions to wine, and determining the electrical conductivity after each addition, it is possible to estimate consecutively the sulphates, total acidity, and tannin substances.

The estimation of volatile bases in wine, P. Dutoit and M. Duboux (*Schweiz. Wchnschr. Chem. u. Pharm., 46 (1908), No. 44, pp. 703–706, fig. 1*).—The results of gravimetric and volumetric estimation of ammonia in wine do not agree, the discrepancies being ascribed to the presence of organic bases. The authors have continued the physicochemical methods noted above for the estimation of ammonia and organic volatile bases.

Notes on essential oils, F. Watts and H. A. Tempany (*West Indian Bul., 9 (1908), No. 3, pp. 265–277, dyms. 2*).—In this article are described the characteristics of oils obtained from lemon grass, bay leaves, and camphor, with remarks on their distillation. A simple form of still is described and illustrated. Chemical analyses are given.

Oil of orange, E. Dowzard (*Amer. Jour. Pharm., 80 (1908), No. 10, pp. 474–476*).—The specific gravity and other constants were determined in 17 samples of normal and adulterated sweet orange oil.

"It is customary to report the rotation of orange oil at 20° C. It is not, however, necessary to determine the rotation at this temperature, as by using the above corrections the constant may be determined at any temperature between 10° and 30° C.

"Owing to the high rotatory power of orange oil, sophistications such as turpentine and lemon oil are easily detected. In doubtful cases the oil should be distilled and the rotation of the first 10 per cent of the distillate determined. The rotation should be not at all or only slightly lower than that of the original oil. . . .

"The common adulterants of orange oil are turpentine, lemon oil, terpenes of lemon and orange oils, and alcohol. All lower the rotation except orange oil terpenes. Alcohol may be detected by shaking a known volume of the sample with water. The alcohol is removed by the water, which of course is increased in volume. Resin has been used as an adulterant and may be detected by a residue determination. The residue on evaporation of pure oil is from 2 to 4 per cent."

Per cent tables for oil in cotton-seed products, C. H. Herty (*Chapel Hill, N. C., 1908, pp. 50*).—A rapid and simple method for obtaining the oil content is described. It is stated that by its use and that of the tables prepared the oil content of cotton seed can be estimated in 30 minutes.

Carrotene from carrots and the substances which accompany it, H. Euler and E. Nordenson (*Ztschr. Physiol. Chem., 56 (1908), pp. 223–235; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 724*).—From 23 kg. carrots 0.7 gm. carrotene and xanthophyll were separated, as well as 13 gm. phosphatids, lecithin, etc., and 3.5 gm. of an unknown oil, 0.5 gm. daucosterol, and 1.3 gm. phylosterol.

A note on the analysis of cutch and the preparation of pure catechin, P. Singh (*Indian Forest Mem., 1 (1908), No. 1, Chem. Ser., pp. 20, pls. 6*).—Consideration is given to the chemistry of cutch and catechin with special reference to the methods of extracting catechin from cutch. The methods of analysis are

discussed and attention drawn to the importance of entirely freeing cutch from catechin and removing all traces of tannin from the latter. A method devised by the author for the entire isolation of pure tannin-free catechin is described and discussed.

The technique of the chemical examination of human feces, F. Oefele (*Technik der Chemischen Untersuchung des Menschlichen Kotes. Leipsic, 1908, pp. 103*).—The systematic examination of the feces by physical, microscopic, and chemical methods is described in this volume, which is designed as a handbook and laboratory guide.

The precipitation and the quantitative determination of creatin in urine by means of picric acid, M. Barberio (*Rend. Soc. Chim. Roma, 6 (1908), No. 10, pp. 158–160*).—A study of methods.

Analyses of wines (*Ann. R. Staz. Agr. Forlì, 1907, No. 36, pp. 13, 14.*)—Analyses of a number of samples of wine are reported and data summarized regarding a number of wines, feeding stuffs, and other materials analyzed.

Report of the analyst [for the year ending November 30, 1907], H. C. Lythgoe (*Ann. Rpt. Bd. Health Mass., 39 (1907), pp. 359–386*).—This report contains analyses and other data relative to milk and milk products, cider, maple products, meats, pickles, and various other substances.

Report on the work of the agricultural chemical control station of Saxony, 1907, H. C. Müller (*Ber. Agr. Chem. Kontrollstat. Halle, 1907, pp. 56*).—During the year 38,821 samples were examined, including 23,031 samples of milk and milk products, 7,932 samples of fertilizer, 4,808 samples of seeds, and 2,036 samples of feeding stuffs, besides many other substances.

Miscellaneous analyses, J. C. Brunnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1907–8, pp. 68–71, 78–83*).—Analyses are reported of butter, milk, whey, cheese, parchment papers, waters, dipping fluids, grasses, and forage plants.

[Miscellaneous analyses], 1907, K. Rördam (*Tidsskr. Landökonom., 1908, No. 3, pp. 145–162*).—A report of the chemist of the Royal Danish Agricultural Society, which contains analyses of butter and oleomargarine, feeding stuffs, artificial fertilizers, and soils, as made for members of the society.

[Miscellaneous analyses], C. F. Juritz (*Rpt. Senior Anal. Cape Good Hope, 1907, pp. 88–104*).—Analyses of "vacca melk," "lacvitum" (a dried milk), wines, water, and sheep and cattle dips.

METEOROLOGY—WATER.

Meteorological observations by farmers, Grohmann (*Illus. Landw. Ztg., 28 (1908), No. 82, pp. 709, 710, fig. 1*).—Brief directions for the simpler observations are given.

Sunspots and weather predictions (*Rev. Gén. Agron., n. scr., 3 (1908), No. 9, pp. 343–346*).—The results of observations bearing on this subject are briefly summarized in this article. These indicate in general that while there is apparently a relation between sunspots and weather conditions on the earth, this fact has not yet been made of much importance in weather forecasting.

On the accumulation and consumption of soil moisture in river plains, E. Oppokov (*Sur l'Accumulation et la Consommation de l'Humidité dans le Sol des Bassins des Fleuves de Plaines. St. Petersburg, 1908, pp. 24*).—This study is based on figures showing the amount of precipitation and run-off of the Dnieper at Kiev during 29 years, 1876 to 1905.

The low run-off of wet years following dry years observed in these studies is ascribed to the fact that in dry years the subterranean waters are lowered and in the wet years raised again to the normal level. This restoring of the equilibrium between the subterranean waters and the moisture of the soil is

called "accumulation," and the following equation is given to represent the circulation of water in wet years following dry years: Rainfall—run-off=loss of water by evaporation+accumulation.

Years of drought are usually years of increased temperature and therefore of increased evaporation, and the conclusion is drawn that the difference between rainfall and run-off does not represent the real amount of evaporation, but that some of the water evaporated is drawn from the subterranean waters. Therefore for dry years the equation for circulation of water would be: Rainfall—run-off+consumption=loss of water by evaporation, "consumption" being the term used to denote the amount of water taken from the subterranean supply during years of drought. This consumption of subterranean waters in years of drought is proved by lowering of wells and drying up of marshes during such years. This is due largerly to transpiration by forest growth and other forms of vegetation.

This is confirmed by study of conditions in the upper basin of the Dnieper in the wooded belt of Russia.

The hydrologic influence of forests under such conditions in years of drought is sometimes entirely injurious, for they become the chief agents of evaporation, although in cold and rainy years they may be useful, since they accumulate more water than they expend. On the other hand, the peaty soils of the marshes absorb moisture drained from higher ground and instead of giving it off to the rivers evaporate it into the atmosphere. Then they gradually encroach on the bed of streams and in the end turn them into marshes.

Summarizing his studies, the author therefore concludes that during dry years, often two in succession, there is apparent a considerable consumption of the reserve moisture held in the soil of the basin and expended by evaporation. This expenditure is replaced by the rains of the following year. This consumption and accumulation is often as much as the run-off. The real amount of evaporation is more than the difference between rainfall and run-off in years of drought, but evaporation is not as much as the difference between rainfall and run-off in wet years. The run-off is relatively large in dry years and relatively small in wet years, because of the slowness of the movement of subterranean moisture.

Forests and marshes of the basin may be considered the most serious agents of evaporation in dry years and their influence extends into the years following dry years. It appears that one should estimate the influence of the forests upon the river flow in the zone given, and generally in central Russia, as almost nil under normal meteorological conditions. This influence is almost negative in dry years in the south and central zones, but it may be that it becomes positive in the north and central zones in wet years if the forests are really capable of accumulating more moisture in times of slight evaporation than they expend in their periods of active growth.

The part played by marshes in feeding rivers is negative in dry years, insignificant in normal years, and not as useful in wet years as one might expect. The draining of marshes lessens useless evaporation and helps to increase flow of rivers in summer.

It must be admitted that marshes are not the most serious factors in the feeding of rivers by subterranean waters, but rather the sandy soils, which are perfect carriers of subterranean water, not alone to the rivers but also to the marshes, which have great need of them in dry years.

The rôle of forests, marshes, and other sorts of vegetable coverings consists chiefly in evaporating the water of the basin and acts indirectly on the formation of atmospheric precipitation.

Climatic and soil moisture conditions in the Great Plains area, L. J. Briggs (*Proc. Trans-Missouri Dry Farming Cong., 1908, pp. 194–205, dgm. 1, map 1*).—This paper contains a brief statement of the character of the investigations on the physical conditions of soil and climate in connection with crop production, and gives some of the results which have been recently obtained on experimental farms conducted by this Department in cooperation with State experiment stations in the Great Plains area.

Climate of the city of Buenos Aires (*Yearbook City Buenos Aires, 17 (1907), pp. 3–50, dgms. 13*).—This report contains a brief historical review of observations in Buenos Aires, with compilations of the results of these observations, some of which date back as far as 1805. The data for 1907 include results of observations on pressure, temperature, rainfall, humidity, velocity of the wind, sunshine, and ozone, carbon dioxid, ammonia, and organic nitrogen in the air, as well as bacteriological analyses of the air and determinations of free ammonia, organic nitrogen, and nitrous and nitric acids in the rain water.

The climate of Abbassia near Cairo, B. F. E. Keeling (*Survey Dept., Egypt, Paper No. 3, pp. 61, pls. 8*).—This report summarizes observations made during the 35 years ending in 1903, giving also the mean values for this period. "As far as possible the results have been summarized in the form of tables, the descriptive part being confined within the limits necessary for explaining them. At the end of the report are given summarized climatological tables, on the plan of the model tables given by Hann in his Climatology. . . . For each of the principal meteorological elements are given the necessary corrections to reduce the means deduced from the present readings made three times a day, to the true daily means published before the closing of the observatory as a first-order station.

"Two series of charts are given at the end. The first series shows the annual curves obtained from the monthly means of each of the principal elements, the second shows the mean daily curves."

The weather of Saxony during 1907 (*Jahresber. Landw. Königr. Sachs., 1907, pp. 2–23*).—The weather conditions for the year at a number of places in Saxony are summarized in notes and tables. The mean temperature of the year was about normal, the highest temperature recorded being 31.9° C., August 6, the lowest, —27.3°, January 23. The rainfall was 819 mm. as compared with a normal of 682 mm. The evaporation was 513 mm. The cloudiness (66 per cent) was about normal.

Damage caused by hail in Servia (*Matér. Statis. Roy. Serbie, 1907, No. 7, pp. XXI+98, map 1*).—Detailed data (in Servian and French) regarding damage caused by hail in Servia from 1896 to 1905 are recorded.

Amount and composition of drainage waters collected from drain gages during 1906–7, J. M. Hayman (*Rpt. Cawnpore [India] Agr. Sta., 1907, pp. 57–62, pls. 2; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 552, II, pp. 890, 891*).—Data from June 1 to October 31 are given for rainfall, percolation, and nitrates in drainage water in case of 2 three-foot and 2 six-foot uncropped drain gages built in 1903. Of the 34.38 in. of rainfall 19.2 and 16.7 in., respectively, percolated through the 2 six-foot gages and 18.2 and 19.9 in. through the 2 three-foot gages. Nitrates were removed in the drainage in case of the six-foot gages at the rate of 180.3 and 200.5 lbs. per acre; in case of the three-foot gages at the rate of 66.7 and 85.6 lbs. per acre. For previous work see an earlier note (E. S. R., 18, p. 815).

Variations in the substances contained in natural waters, C. Weigelt and H. Meihring (*Chem. Indus. [Berlin], 31 (1908), No. 15–16, pp. 472–486*).—Numerous analyses of river waters are reported, showing the variation at different periods in mineral matter and oxygen.

Some features of Iowa ground waters, W. S. HENDRIXSON (*Proc. Iowa Acad. Sci., 14 (1907), pp. 187–199*).—The character of these waters is briefly discussed on the basis of chemical analyses of a number of samples from deep and shallow wells. The investigations were made in cooperation with the U. S. Geological Survey.

Methods of sterilizing water by means of permanganate of potash, FERRAUD and G. LAMBERT (*Rev. Hyg. et Pol. Sanit., 30 (1908), No. 7, pp. 553–563*).—The methods of Hy and Lambert are described, and tests of their efficiency are reported. The general conclusions reached are that all reactions which involve the precipitation of manganese oxid in a solution of permanganate may be used as bases for processes for the sterilization of water. The bactericidal action is due solely to the formation of this precipitate. The authors are of the opinion as the result of these and previous experiments that the bactericidal action is a phenomenon of radio-activity.

The Merthyr sewage farms, T. F. HARVEY (*Jour. Roy. Sanit. Inst., 29 (1908), No. 10, pp. 648–655; Surveyor, 34 (1908), No. 862, Sup., pp. 14–16*).—The methods of sewage disposal which have been in use at Merthyr since 1858 are briefly described, but particular attention is given to the present methods of disposal on two sewage farms. The sewage from a city of about 100,000 population is satisfactorily disposed of on these farms by surface irrigation.

"It may be fairly claimed that the working of the Merthyr sewage farm . . . . has been successful, and while the stipulation that 'profit is to be subservient to the proper disposal of sewage' has been strictly adhered to, the pecuniary result has been satisfactory. Taking an average over the last ten years, the yearly general expenditure on all the farms has been £1,914 4s. 9d. [about $9,417] and the yearly revenue £2,744 17s. 4d. [about $13,312.56] showing a profit over and above the working expenses of £802 12s. 7d. [about $3,892.72] per annum."

SOILS—FERTILIZERS.

Studies on soils, A. ATTERBERG (*Landw. Vers. Stat., 69 (1908), No. 1–2, pp. 93–143, figs. 2; abs. in Chem. Ztg., 32 (1908), No. 87, Repert., p. 554; Chem. Abs., 3 (1909), No. 2, pp. 220, 221*).—In continuation of previous investigations (E. S. R., 15, p. 549) the author studied the properties and arrangement of the physical constituents of soils of different types. Among the topics reported upon are the size and methods of separation of different soil constituents; the hygroscopicity of fine sand; the volume, air space, and capillarity of sandy soils; evaporation from sands; the relation of sand to precipitation; percolation in sand; relation of sand to root hairs of plants; the flocculation of fine sand; Brownian motion; the rational classification of sand; and analyses of glacial and alluvial sandy soils.

A modified classification of the sandy particles in soils is proposed. The word sand is confined to the coarse sand of dry sandy soils. The fine sand of better soils is termed "mo." Sand finer than 0.02 mm. in diameter is considered to be clay-like in properties. The word "ler" is used to designate the finest sand and amorphous clayey particles. The more important capillary properties of the sand particles are discussed.

The annual fluctuations of soil temperature in different climates, W. KÜHL (*Der jährliche Gang der Bodentemperatur in verschiedenen Klimaten. Inaug. Diss., Univ. Berlin, 1907, pp. 68, dgms. 4*).—Data from a number of places in Europe, Asia, Australia, and Central America are compiled and analyzed, the yearly fluctuations of soil temperature with reference to air temperature being illustrated in a series of diagrams. A bibliography of 47 references is given.

The temperature of soils and water near Breslau in comparison with the temperature of the air, B. Schulze and H. Mehring (*Fühling's Landw. Ztg., 57 (1908). No. 20, p. 673–678, dgms. 3*).—The results of observations during a series of years (1901–1906) on the temperature of the soil at depths of from 20 to 130 cm., of the water of the Oder River, and of the air are summarized and compared.

The extremes of temperature at each depth were very nearly the same for the 6 years, but decreased in different cases with the depth in the soil. The greater the depth the greater the lag of the soil temperatures behind the air temperatures.

The average annual temperature of the soil at a depth of 20 cm. was 8.7° C., corresponding very closely with that of the air (8.6°) and being about 1° lower than that of the river water. The mean temperature at depths of 40, 70, 100, and 130 cm. was almost the same, 9.2 to 9.4°.

The behavior of the organic matter of soils and the osmotic pressure of the same, J. König, J. Hasenbäumer, and H. Grossmann (*Landw. Vers. Stat., 69 (1908), No. 1–2, pp. 1–91, figs. 5; abs. in Chem. Zentbl., 1908, II, No. 14, pp. 1198, 1199; Chem. Ztg., 32 (1908), No. 86, Repert., p. 548; Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 888; Jour. Soc. Chem. Indus., 27 (1908), No. 23, pp. 1166, 1167; Chem. Abs., 3 (1909), No. 2, p. 221*).—In continuation of previous investigations, the authors studied 9 typical soils with reference to their chemical and physical properties and the behavior of the organic matter of the soils under treatment with steam under pressure and when subjected to oxidation by means of hydrogen peroxid.

The methods and apparatus used in these treatments are described and data are given for soil constituents dissolved by treatment with steam and with hydrogen peroxid and for the carbon dioxid evolved in the treatment with the latter substance. The laboratory experiments were supplemented by a series of pot experiments in which treated and untreated soils were used for the growth of barley and oats with and without the addition of fertilizer mixtures of different kinds. The methods used and the results obtained in a series of studies of the osmotic pressure of the soil and of various salts, carbohydrates, etc., are given in detail. The results of the investigations were in brief as follows:

(1) By treatment of soil with steam under pressure the plant food present in the form of complex salts or inorganic matter is brought into solution. While the pressure to be used will depend upon the kind of soil, 5 hours' treatment with steam under a pressure of 5 atmospheres (5 liters of water to 500 gm. of soil) was usually found to be the most effective treatment.

(2) This treatment is capable of showing the larger differences in a content of more easily soluble nutrients, but is not capable of showing the small differences due to the use of fertilizers.

(3) Treatment with hydrogen peroxid renders soluble like but somewhat higher quantities of these plant food constituents, but this method is not capable of indicating slight differences in soluble constituents, as for example, those due to application of fertilizers.

(4) A small proportion of the soil constituents not dissolved out of soils by pure water or by water containing carbon dioxid becomes soluble in water under treatment with steam under pressure in the presence of humus acids or by oxidation. This is thought to indicate that part of the constituents are present in complex or organic combination, as has been found to be the case in moor soils. These constituents, which perhaps are in combination with humus acids, are doubtless important sources of mineral nutrients of plants.

(5) The humus was found to occur in soils in forms which varied in ease of oxidation.

(6) The quantities of plant food constituents dissolved by treatment with steam or by oxidation calculated to a soil depth of 20 cm. and the amounts taken up by plants show a definite relation only in the case of potash, but is so consistent in case of this constituent that treatment with steam seems to be well adapted for the determination of available potash in soils. Apparently potash is also set free during the growth of plants either as a result of decay or of root activity.

(7) The pot experiments showed that the percentage of mineral matter in fertilized plants was usually much smaller than in unmanured plants, probably due to the more rapid growth of the plants. The absorbent power of the soil for water, as well as the use of fertilizers, reduces evaporation, and thus aids the growth of plants by furnishing a more uniform supply of water.

(8) It was found that soils possess a small but decided osmotic pressure, and this furnishes a means of securing valuable information as to the solubility of the soil constituents. Suggestions are made as to the application of measurement of osmotic pressure in the study of soils.

(9) According to the authors' observations very small amounts of soluble salts (a few milligrams in 100 gm. of soil) may be observed by means of osmotic pressure. The osmotic pressure was also found to stand in direct relation to the amount of dry matter in plants grown on the soil.

(10) The amount of water entering the osmometer, which in these experiments consisted of clay tubes and also filter cylinders, depended upon the thickness of the tube and the kind of semipermeable membrane used. Clay filter cylinders which under a pressure of 1½ atmospheres allowed 900 cc. of water to pass through in 10 minutes were found to be most suitable. Such cylinders, provided with a double semipermeable membrane consisting of one side of glue solution and formaldehyde and on the other of potassium ferrocyanid and copper sulphate, furnish a very durable osmometer, which can be used six times if after each test it is washed out and treated (hardened) with formaldehyde.

(11) With filter cylinders of lower permeablity (700 cc. of water in 10 minutes) a slower exchange of solution occurs, but the relationship remains the same between the various salts and the soil if tubes of the same permeability are employed. For comparative purposes it is recommended that substances of known osmotic pressure, as for example, one hundredth-normal ammonium sulphate or one hundredth-normal saccharose, be used.

(12) The method may also be used for the determination of the molecular weights of certain substances since the amount of water entering the osmometer stands in inverse relation to the molecular weight.

The water problem in agriculture, E. J. Russell (*Nature [London]*, *78 (1908)*, *No. 2023, pp. 322, 323*).—Recent reports on soil moisture and its conservation, more particularly that of J. W. Leather on the loss of water from soil during dry weather (E. S. R., 20, p. 214), are briefly reviewed in this article.

The loss of water from soil, C. von Seelhorst (*Jour. Landw., 56 (1908)*, *No. 2, pp. 208, 209; abs. in Chem. Zentbl., 1908, II, No. 7, p. 632*).—It was found that in cylinders recently filled with soil the percolation was greater and evaporation less than in case of cylinders which had been filled for some time.

Studies of soil moisture in the Great Plains region, F. J. Alway (*Jour. Agr. Sci., 2 (1908)*, *No. 4, pp. 333–342*).—These studies were made in connection with a series of investigations which have been noted from time to time (E. S. R., 19, p. 516). The observations reported were made during July, 1904,

and September, 1905, on the Canada Experimental Farm at Indian Head, and at Moose Jaw, Saskatchewan. The samples were taken from foot sections down to a depth of 6 ft. on uniform and mixed soils.

Data are given for total percentage of water, hygroscopic coefficient, and percentage of free water. The conditions on cropped and fallow soils were compared. The results are summarized as follows:

"(1) All determinations of soil moisture should be made to a depth of from 4 to 5 ft. for wheat and oats, and to a depth of 6 or 7 ft. for grasses.

"(2) Unless all the soil under consideration is very uniform, determinations of the hygroscopic coefficient are indispensable. The determination of this value is extremely important even where the soil is uniform.

"(3) The storage capacity for available water of the two soil types studied may be placed at from 5 to 7 in. of rainfall for wheat and oat crops.

"(4) A better idea of the moisture conditions of the soil at Indian Head may be obtained from a casual examination in the field than from the drying and weighing of the samples, unless the hygroscopic coefficient is considered.

"(5) The moisture stored in the subsoil during the previous summer, and not the frost of the preceding winter, is the cause of the high yields of wheat and oats obtained in southern Saskatchewan.

"(6) The soil of southern Saskatchewan does not remain permanently frozen at any depth.

"(7) Investigations of the moisture conditions to a depth of only 12 to 16 in. are of no value and may often be entirely misleading."

Studies on the soils of the northwestern portion of the Great Plains region: Nitrogen and humus, F. J. Alway and R. S. Trumbull (*Amer. Chem. Jour., 40 (1908), No. 2, pp. 147–149*).—In connection with studies of these soils previously reported (E. S. R., 19, p. 516), the authors determined the nitrogen and humus content of 20 samples of soils at different depths from this region. The results in general show "that the surface soil of the semiarid portions of western Canada possesses the characteristics of humid regions, while the subsoil shows the marked peculiarities of the subsoils of other arid regions."

The humus content varied from 0.8 to 2.45 per cent, the total nitrogen from 0.1 to 0.3 per cent. The total nitrogen in form of humus nitrogen varied from 27.3 to 60 per cent, the percentage of nitrogen in humus from 4.08 to 7.14.

A soil survey of seventeen counties of southern Indiana, C. W. Shannon et al. (*Ind. Dept. Geol. and Nat. Resources Ann. Rpt., 32 (1907), pp. 17–298, figs. 30, maps 17*).—This report includes a brief account of the Indiana soil survey as organized under the State department of geology, by C. W. Shannon; a discussion of the chemical composition of Indiana soils, with descriptions of methods of soil analysis used, by R. E. Lyons; descriptions of Indiana soil types, by C. W. Shannon; and accounts of soil surveys of Monroe, Brown, Lawrence, Martin, Orange, Washington, and Jackson counties, by C. W. Shannon and L. C. Snider; of Decatur, Jennings, Jefferson, Ripley, Dearborn, Ohio, and Switzerland counties, by L. C. Ward; and of Clark, Floyd, and Harrison counties by R. W. Ellis.

The survey is conducted on a plan similar to that of the Bureau of Soils of this Department, which has covered 19 counties of the State.

Agricultural soils [of Maryland], W. B. Clark and E. B. Mathews (*Md. Geol. Survey [Rpt.], 6 (1906), pp. 209–223*).—A general description is given of the typical soils of different sections of the State, attention being called particularly to their great diversity.

Canada's fertile northland, edited by E. J. Chambers (*Ottawa: Govt., 1908, pp. 139, pls. 16, maps 5*).—Maps and descriptions are given of "the northern portions of the provinces of Quebec, Ontario, Saskatchewan, Alberta, and

British Columbia, the Yukon Territory, and those vast regions known as the Northwest Territories." The agricultural possibilities of the region are discussed.

On the occurrence of phosphoric acid in buntersandstein and soils of the eastern Black Forest, M. Bräuhäuser (*Mitt. Geol. Abt. K. Württemb. Statis. Landesamts, 1907, No. 4, pp. 22*).—Determinations of phosphoric acid in a large number of samples of sandstone are reported and the bearing of the phosphoric-acid content of the rocks upon the soils derived from them is discussed. While the percentage of phosphoric acid found is quite variable, it is in many cases sufficiently large to account for the large supply of phosphoric acid in soils derived from them.

Soils, H. Ingle (*Transvaal Dept. Agr. Ann. Rpt. 1907, pp. 240–247*).—Analyses of a number of samples of Transvaal soils are reported, the results confirming previous conclusions that as a rule these soils are poor in organic nitrogenous matter, lime, and phosphoric acid, but rich in potash compounds. The presence of ferrous compounds was detected in newly broken soil, especially in case of the black soils, but it is thought that these compounds do not occur in sufficient amounts to be a serious evil. The soils were found to vary considerably in suitability for irrigation, the black soils rich in organic matter and in lime being particularly difficult to handle when first brought under irrigation. The soils rich in lime are also rich in organic matter, while most of the red porous soils examined are remarkably poor in humus.

Analyses of soils, C. F. Juritz (*Rpt. Senior Anal. Cape Good Hope, 1907, pp. 97–102, map 1*).—The more important results obtained from an examination of 69 samples of soils from different parts of Cape of Good Hope are summarized and a detailed study of the soils of the government experiment station at Robertson is reported, with a map showing surface distribution and soil profiles.

On eruptive soils, E. C. J. Mohr (*Bul. Dept. Agr. Indes Néerland., 1908, No. 17, III, pp. 12*).—Under this name are included various kinds of volcanic soils which prevail in Java. Brief descriptions of the formation and character of these soils are given.

Soils of nonsugar districts (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 1907, pp. 1–3*).—Analyses of samples of typical soils from a number of districts are reported.

The nitrogen compounds of the fundamental rocks, A. D. Hall and N. H. J. Miller (*Jour. Agr. Sci., 2 (1908), No. 4, pp. 343–345*).—The results of determination of carbon and nitrogen in unweathered samples of a number of deep-seated rocks and of nitrates produced by the weathering of the ground rocks are briefly reported and discussed in this article.

The authors conclude "that the nitrogen compounds of the soil are not wholly of recent origin, but have in part been derived from the rock out of which the soil has been formed by weathering. In some of the clay soils the proportion of nitrogen due to the original rock is likely to be considerable, which may account for the comparative infertility of many clay soils which by analysis appear to be rich in nitrogen. Such nitrogen compounds are, however, to some slight extent slowly attacked by bacteria and yield nitrates available to the plant."

On the question of nitrification in the sea, B. L. Issatschenko (*Abs. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 13–14, p. 430*).—A report is given of the discovery of a nitrifying bacterium from the depths of the Arctic Ocean.

Quantity of nitric nitrogen in soils variously cultivated, C. Montanari (*Staz. Sper. Agr. Ital., 41 (1908), No. 5–6, pp. 209–222*).—The experiments here reported were to determine the amount of nitric nitrogen in the soil during

the growing period of various crops. The crops were wheat, medic, and fall-sown rape followed by corn. Samples of soil were taken from 0 to 10 in. and from 10 to 20 in.

It was observed that the average amount of nitrates found in the case of wheat and of rape and corn was greater in the lower stratum, but with medic, especially in summer and autumn, the average amount was greater in the upper stratum. For all crops named the smallest quantity was found in February, March, and June, and the largest quantity from July to December. The author thinks the greater amount in the upper stratum in the case of medic is due to the fact that the roots of this plant have tubercles which absorb less nitrates in the upper stratum of the soil, while wheat, rape, and corn have abundant absorbing roots near the surface.

Determinations were also made of the nitric nitrogen in the soil moisture with the result that the least was found in March and June and the most in August, that is, at the time when the soil has least moisture.

These experiments were terminated at the end of the third year, so that sufficient data were not obtained to warrant definite conclusions.

White mustard in its relation to nitrogen assimilation. O. Lemmermann and E. Blanck (*Landw. Vers. Stat., 69 (1908), No. 1–2, pp. 145–160*).—The experiments reported were conducted for the purpose of determining more definitely the influence of white mustard on the nitrogen content of the soil. The results and views of different investigators are briefly noted and the authors' own work is described.

The results of soil analyses made showed that during the period of vegetation a soil growing peas had a higher nitrogen content than the same kind of soil growing barley and mustard. It was further found that if during the period of growth any nitrogen assimilation in the soil took place the quantity assimilated in the soil growing mustard was not greater than that in the soil producing barley.

To samples of soil from these different plats weighing 1,000 gm. was added 20 gm. of sugar as a source of energy to the soil bacteria. Analyses of these samples were made 46 and 92 days after this treatment. Analyses of the soils from the different plats without the sugar treatment showed that under the influence of mustard roots no nitrogen increase in the soil had taken place. On the other hand, the samples treated with sugar showed marked differences in the nitrogen assimilated, from which the authors conclude that in all these soils nitrogen-assimilating organisms were present. After 46 days the barley soil showed 1.458 mg. of nitrogen per 100 gm. of soil, the mustard soil 3.232 mg., and the pea soil 16.402 mg. For the 92-day period the figures were 6.886, 9.132, and 14.926 mg., respectively.

Work of the chemical laboratory of the Ploti Experiment Station, 1907. B. Welbel and A. Winkler (*Ghodichnuiĭ Otchet Ploty. Selsk. Khoz. Opuitn. Stantsiĭ, 13 (1907), pp. 105–160, 175–191*).—The work here reported followed in the main the same lines and confirmed in large measure the results of previous investigations (E. S. R., 19, p. 923), but in view of the fact that conditions are more or less abnormal in lysimeters the field studies on nitrification were extended during the year and were supplemented by pot and box experiments on the same soils. This report deals more particularly with the results of studies of nitrification in plats occupied by spring and winter wheat and by fallow. On the spring wheat plats the influence of previous crops of leguminous plants, cereals, or three years' bare fallow was studied, and on the winter wheat plats the influence of different kinds of fallow (black and green) and of farm manure.

The results show in general that the cultural methods commonly found to increase the yield of wheat have in every case increased the activity of nitrification in soils, the different methods of experimenting giving like results in this respect. It was shown in pot experiments that not only the assimilable nitrogen but also the available phosphoric acid was increased by fallow and by the application of manure.

The action of carbon bisulphid and other substances on soils, K. Störmer et al. (*Jahresber. Ver. Angew. Bot., 5 (1907), pp. 113–131+XXXIII–XXXIX*).—In continuation of previous experiments the authors tested the effect on the yield of crops grown in pots of treating the soil with carbon bisulphid, carbon tetrachlorid, chloroform, benzol, toluol, xylol, phenol, o-cresol, m-cresol, p-cresol, alcohol, and ether.

All of these, except p-cresol, alcohol, and ether, decidedly increased the yield of crops following fall application of the substances. Previous experiments had shown that all of the substances increased the yield. An increase of yield apparently occurs whether the substance used is a source of carbonaceous food for soil organisms or not, or whether the soil is "sick" or not. The authors attribute the effect of the substances to their action on the nitrogen and the flora and fauna of the soil. This phase of the subject was studied by the authors in water cultures and pot experiments. In the latter carbon bisulphid was used at the rate of 1.6 gm. per kilogram of soil, carbon tetrachlorid 2.4 gm., benzol 1.6 gm., xylol 1.6 gm., phenol 1.25 gm., and p-cresol 1.25 gm.

The authors' results agree with those of Wagner and Pfeiffer in showing that carbon bisulphid and like substances reduce denitrification and fixation of nitrogen. Nitrification was also retarded at first, but ammonification was not retarded to a like extent and later the ammonia was rapidly nitrified.

On the influence of oxygen on the decomposition of vegetable matter, D. Carbone and R. Marincola-Cattaneo (*Arch. Farmacol. Spr. e Sci. Aff., 7 (1908), Nos. 6, pp. 265–276; 7, pp. 289–301*).—From a detailed technical study of the behavior of different organisms under varying culture conditions with reference to the oxidation of organic matter, the authors confirm the conclusion of Rossi that the Schizomycetes are not as a rule very active agents of decomposition of organic matter. Many active agents of decomposition, however, are found among the Eumycetes. Oxygen seems as a rule essential to the most efficient action of the organisms decomposing organic matter, although the authors' results indicate that it is not possible to divide the agents of decomposition strictly into aerobes and anaerobes. The authors attribute to the higher fungi the more important rôle in the decomposition of organic matter in general, and particularly cellulose, either in the absence, but especially, in the presence of oxygen. They are thus important agents in the formation of humus in the soil.

Notes on the rôle of micro-organisms in modern agriculture, especially in cultivated soils, B. Heinze (*Abs. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 17–19, p. 543*).—This is a review of present knowledge on various phases of the subject.

Nutrition of nitrogenous bacteria, Helene Krzemieniewska (*Bul. Acad. Sci. Cracovie, 1908, pp. 445–448; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 722*).—The author's investigations point to the conclusion that potassium salts are essential for the nutrition of nitrogenous bacteria notwithstanding the statement of Gerlach and Vogel to the contrary.

Inoculation experiments with Azotobacter; bacteriological studies in Madison soil; ammonification in culture solutions as affected by soil treatment, J. G. Lipman (*Abs. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 17–19, pp.

541, 542).—This is the author's abstract of an article in the report of the New Jersey Stations for 1907 (E. S. R., 19, p. 1017).

Legume bacteria. S. F. Edwards and B. Barlow (*Abs. in Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 17–19, p. 541*).—This is the authors' abstract of Bulletin 164 of the Ontario Department of Agriculture (E. S. R., 19, p. 1121).

Beneficial bacteria for leguminous crops, G. H. Earp-Thomas (*Proc. N. Y. Farmers, 1907–8, pp. 23–41*).—This article describes various methods which have been employed for the preparation of cultures of the organisms of the root tubercles of leguminous plants, and reports particularly the successful use of cultures prepared by the author's method, in which the attenuated tubercle organism is restored to full vigor by inoculation through a series of young plants in succession. This is substantially a process of selection and results in securing organisms of high virility.

The resistant power of root bacteria of leguminous plants and its importance in soil inoculation, J. Simon (*Jahresber. Ver. Angew. Bot., 5 (1907), pp. 132–160, fig. 1*).—A study of the culture conditions most favorable to the production of active inoculation and nitrogen assimilation is reported. Among the conclusions reached is that for isolation of the organisms gelatin can not be dispensed with, but that for the further growth of the organisms soil and soil extract (with the addition of mannite and grape sugar) is preferable. Carbon bisulphid is a valuable means of restoring the biological equilibrium in soils and of promoting the growth of leguminous plants, but its use on a large scale is impracticable.

Increasing the yield of crops, especially serradella, by inoculation with Nitragin, Westmann and Hiltner (*Jahrb. Deut. Landw. Gesell., 23 (1908), No. 2, pp. 281–308*).—Very beneficial effects from the use of Nitragin, especially on serradella, are reported. Hiltner reports that his experiments show that the addition of nutrient materials at the time of inoculation is not necessary on moor and other humus soils and frequently of no effect on other soils. Of the nutrient substances calcium carbonate is especially effective. Tricalcium phosphate, humus, and milk powder are also effective, while superphosphate and lime nitrogen are decidedly injurious. Mixtures of peptone and grape sugar have often shown their effectiveness, but peptone and cane sugar has frequently proved decidedly more effective.

The new agriculture, W. B. Bottomley (*London, 1908, pp. 15, pl. 1, figs. 6*).—In this article a brief account is given of the results obtained from the use in different parts of the British Isles of the inoculating material distributed by the author, and reference is made to the possibility of using inoculation as a means of increasing the growth of nonleguminous plants. It is stated that a special culture suited to the Tropics has been extensively distributed for test in the West Indies and other tropical possessions of the British Empire, especially with a view to increasing the growth of sugar cane.

The productiveness of the soil, A. Grégoire (*Ann. Gembloux, 18 (1908), No. 8, pp. 455–460*).—In this, the concluding paper of a series of articles on this subject (E. S. R., 19, p. 1015; 20, pp. 16, 217, 314, 521), the author considers briefly three classes of factors which determine the productiveness of soils, namely, (1) factors over which man can exercise no control, (2) factors which are partly under his control, and (3) factors which are entirely under his control.

The author is inclined to Kellner's view that each plant has special needs which are the outcome of its evolution under the conditions of the environment in which it has developed, and therefore soils may be classified according to the plants which they are capable of bringing to normal development. This furnishes a safe basis for the preparation of useful agronomic charts.

On the planting and reclamation of moors and bogs in Belgium, with special reference to the use of artificial manures, A. P. GRENFELL (*Quart. Jour. Forestry, 2 (1908), No. 4, pp. 267–282, fig. 1*).—This article gives an account of drainage and reforestation experiments in the royal forests of Hertogenwald, of eastern Belgium, and of drainage, irrigation, trenching, fertilizing, and fixation of moving sands on the dry sandy heaths and marshes of the Campine. Systems of drainage employed are described with specifications of cost.

In the improvement of the soils of the Campine "recourse is had to artificial manures, sometimes to road scrapings and town refuse, or both together; or better still to artificial combined with green manures, especially lupines. In the last case catch crops, especially barley, can be reaped, which will materially diminish the cost.

"The use of basic slag and kainit, also of lupines, has become part of modern practice for the planting and reafforestation of the Campine, and has already given satisfactory results."

Analyses of typical soils of the Campine at different depths are reported.

Progress in moor culture during the last 25 years, M. FLEISCHER ET AL. (*Die Entwickelung der Moorkultur in den letzten 25 Jahren. Berlin, 1908, pp. XXVIII+233, pls. 6, figs. 107*).—This volume was prepared in celebration of the first 25 years' existence of the Association for the Advancement of Moor Culture in the German Empire.

It contains a brief review of the work of the association by M. Fleischer, and papers on state work on moor culture in Prussia by H. Thiel; the moor culture station of Bremen by B. Tacke et al; state work in moor culture in Bavaria by A. Baumann; the scope and results of the German-Austrian Moor Culture Association by H. Schreiber; progress in moor culture in Denmark by T. C. Westh, in Sweden by H. von Feilitzen, in Norway by J. G. Thaulow, and in Finland by A. Rindell; the most important forms of humus and peat in the North German moors by C. A. Weber; colonization of the upland moors by Quaet-Faslem; the use of convicts in moor culture and colonization by Krohne; the formation and care of meadows and pastures on upland moors by B. Tacke, and on lowland moors by Krahmer; moor drainage by Sarauw; moor structures by Krüger; and the present status of the industrial use of peat as fuel by L. C. Wolff.

New methods in the field of moor culture, B. TACKE (*Ann. Sci. Agron., 3. ser., 3 (1908), I, pp. 68–72; Zentbl. Agr. Chem., 37 (1908), No. 5, pp. 291–295*).—This is a report submitted to the Eighth International Congress of Agriculture at Vienna, which deals briefly with kinds and character of moors, and their preparation for cultivation, drainage, cultivation and utilization, fertilizing, suitable systems of farming, and colonization.

Modern and early work upon the question of root excretions, H. S. REED (*Pop. Sci. Mo., 73 (1908), No. 3, pp. 257–266*).—This article reviews the work on root excretions by different investigators and reports some of the results secured by the Bureau of Soils of this Department. Soil upon which wheat failed to grow after continuous wheat culture yielded a small quantity of a crystalline organic compound which, when dissolved in pure water, showed a toxic action upon wheat plants while relatively harmless to cowpeas. In a similar way cowpea-sick soil furnished crystals found to be harmful to cowpeas but relatively harmless to wheat plants. The same soil in which neither plant was grown yielded none of these substances, and hence it is concluded that these substances were formed as a result of the plant growth in that soil.

Crop rotation and soil exhaustion, F. FLETCHER (*Separate from Cairo Sci. Jour., 2 (1908), No. 19, pp. 8*).—Noted from another source (E. S. R., 20, p. 521).

Annual review of agronomy. D. Zolla (*Rev. Gén. Sci., 19 (1908), No. 14, pp. 577–585*).—This article reviews new theories of soil fertility, particularly those advanced by the Bureau of Soils of this Department, and experiments on the use of manganese as a fertilizer, on the permeability of soils as related to irrigation, and on the utilization of alkali soils for the culture of rice in La Camargue.

Experiments on the decomposition and fertilizing value of manure. B. Sjollema and J. C. de Ruijter de Wildt (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1907, No. 1, pp. 21–68, figs. 2; abs. in Zentbl. Agr. Chem., 37 (1908), No. 10, pp. 652–654*).—A series of studies of the fermentation and tests of the fertilizing value of manure, in comparison with other nitrogenous fertilizers, in continuation of previous investigations (E. S. R., 18, p. 325), are reported.

The experiments on decomposition were made with 2 kg. lots of fresh cattle manure treated in different ways for 2 months. The manure from these experiments as well as fresh manure was used in comparison with nitrate of soda and sulphate of ammonia on oats followed by rape grown in cylinders. The results show that an important loss of free nitrogen may take place in manure, the loss depending, in addition to length of fermentation and temperature, largely upon the amount of exposure to the air. At room temperature the loss is much smaller than at a temperature of 35 to 37° C., and ceases at about 50°. The exact cause of the loss was not determined in the experiments, but appeared to be due to oxidation of ammonia by micro-organisms. With protection from the air no loss of nitrogen occurred either in the form of free nitrogen or of ammonia, not even with a very vigorous gas formation (methane and carbon dioxid) lasting several months. With fermentation under aerobic conditions combustion of organic material apparently occurred whereby oxygen was partly taken up by other compounds of the manure, or decomposition took place whereby carbon dioxid was formed without absorption of oxygen. Both with protection from and exposure to the air the furfurol-producing substances in manure were attacked, and more violently than the other constituents of the manure.

The cylinder experiments showed that the ammonia content of the manure is not always a correct measure of the fertilizer effect. The composition of the nitrogen compounds can not be taken exclusively, since the more or less fermented state of the nitrogen-free constituents must also play a large part. The nitrogen in those kinds of manure in which the furfurol-producing constituents were most fermented had the best effect. This is attributed to destruction of the food for denitrifying organisms. Anaerobic fermentation at higher temperature increased decidedly the direct fertilizing value of stable manure, since with a violent fermentation of the organic material and decomposition of furfurol-producing constituents, vigorous formation of ammonia takes place, and no loss of nitrogen either as ammonia or in a free state need be feared. Of manure in which favorable decomposition has taken place about one-third of the nitrogen can be taken up by the plant roots within a single month, so that the ratio of availability of this nitrogen to that of nitrate of soda is about 50:100. Fresh manure shows in the same year a greater after-effect than one subjected to fermentation, but this is not enough to compensate for the smaller increase of the first crop. The after-effect of stable manure which has fermented at various temperatures under aerobic and anaerobic conditions is slight in the same year, and the experiments reported show no noteworthy difference in the amount of this after-effect.

Note on the absorption of atmospheric moisture by certain nitrogenous manures, G. BROWNLEE (*Jour. Agr. Sci., 2 (1908), No. 4, pp. 380, 381, chart 1; abs. in Chem. Abs., 3 (1009), No. 1, p. 93*).—"Ten gm. each of the manures sulphate of ammonia, nitrate of soda, calcium cyanamid, and nitrate of lime (Notodden, 1906) were exposed to air in a room the windows of which were kept open during the experiment, and the changes in weight noted for a period of 29 days. At the same time barometric and temperature (wet and dry bulb) readings were taken daily.

"The percentages of moisture in the manures at the commencement were as follows: Sulphate of ammonia 4.52, nitrate of soda 2.85, calcium cyanamid 0.50, nitrate of lime 2.02. . . .

"The sulphate of ammonia became rather drier during the experiment and was quite powdery at the finish.

"The nitrate of soda was found at the end to be wettish underneath. Apparently its condition varies with the state of the atmosphere. In another experiment on a different sample of the ordinary commercial salt, when the air was very moist for many days in succession, nitrate of soda became quite wet. Evidently this manure can not always be conveniently kept under ordinary conditions.

"The calcium cyanamid remained unchanged in appearance throughout the experiment. It was, however, partly caked, though quite dry and powdery to the touch. (H. von Feilitzen states [E. S. R., 19, p. 221] that calcium cyanamid prepared by the Polzenius process contains a slight excess of calcium chlorid, which renders the product very hygroscopic, causing it to cake together in hard lumps and to burst the containing sacks.) On opening a bottle containing calcium cyanamid there is always a smell of ammonia, showing that this substance would deteriorate if left exposed.

"The nitrate of lime showed signs of becoming wet after a few hours' exposure and by the third day was quite liquid. It is, therefore, obvious that the Notodden product as made in 1906 must be deemed unsatisfactory from a farmer's point of view."

The changes in weight and in atmospheric conditions are illustrated in a chart.

Impurity of nitrate of soda and the use of crude nitrate, S. DE GRAZIA (*Staz. Sper. Agr. Ital., 41 (1908), No. 5–6, pp. 258–269*).—The author has already reported on this subject with reference to rye.[a] In that report it was established that the impurities in nitrate of soda were beneficial, but the nature of the impurities was not determined.

The experiments here reported were with wheat and barley in pots and included comparisons of various salts found in commercial nitrate of soda—sodium chlorid, potassium iodid, and magnesium sulphate.

The conclusion reached is that the salts constituting the impurities of commercial nitrate of soda, except perchlorate of potash, are of value to plants, and that within certain limits a less refined nitrate is more profitable as a fertilizer than a purer salt.

Comparative tests of sulphate of ammonia and nitrate of soda, BACHMANN (*Landw. Wchnbl. Schles. Holst., 58 (1908), No. 42, pp. 708–712*).—The results of 4 years' tests with rye, oats, barley, kohl-rabi, sugar beets, and potatoes on different kinds of soil are summarized. The results varied widely, particularly with the ammonium sulphate, showing that the fertilizing value of this material is particularly dependent upon the character of the season, moisture, temperature, etc.

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[a] Staz. Sper. Agr. Ital., 39 (1906), No. 6–7, p. 529.

Comparison of organic nitrogenous fertilizers with nitrate of soda, M. Popp (*Landw. Vers. Stat., 68 (1908), No. 3–4, pp. 253–300; abs. in Chem. Ztg., 32 (1908), No. 48, Repert., p. 311; Chem. Zentbl., 1908, I, No. 26, pp. 2199, 2200; Jour. Chem. Soc. [London], 94 (1908), No. 550, II, pp. 727, 728; Chem. Abs., 3 (1909), No. 2, pp. 221, 222; Zentbl. Agr. Chem., 37 (1908), No. 12, pp. 796–805; Ztschr. Angew. Chem., 22 (1909), No. 5, p. 207*).—Blood meal and horn meal were mixed in amounts furnishing 0.2 and 0.4 gm. of nitrogen with 250 gm. of soil and ammonia and nitrates determined in the water extract at the beginning and after 2, 6, and 12 weeks. Experiments in large cylinders to study the rate of nitrification and effect on growth of rye, wheat, oats, and carrots in rotation were also made with these materials and with castor-bean meal, raw bone meal, dry ground fish, meat meal, molasses manure, poudrette, wool dust, leather meal, etc.

There was very slight increase of ammonia until after 2 weeks' time, and under the most favorable conditions not more than 14 per cent was found. The addition of calcium carbonate but slightly increased the rate of formation of ammonia.

It was observed that by distillation of the soil extract the total amount of ammonia present was not found, a certain amount, especially in the case of loam soils, being held so firmly that it was not washed out by the water. The dried blood uniformly yielded more ammonia than the horn meal. In no case was there a complete transformation of the organic nitrogen into nitric nitrogen. Under the most favorable conditions 72 per cent of the nitrogen was thus transformed in the case of dried blood and in case of horn meal about 57 per cent.

The relative efficiency of the different materials in the cylinder experiments was on the basis of nitrate of soda as 100: Blood and horn meal 70; fish meal, castor-bean meal, and meat meal 60; poudrette and bone meal 55; molasses manure 40; wool dust 25; and leather meal 10.

The use of nitrogenous fertilizers and of nitrate of lime, L. Malpeaux (*Jour. Agr. Prat., n. scr., 16 (1908), No. 35, pp. 265–267*).—Comparative field tests of nitrate of soda, sulphate of ammonia, nitrate of lime, and cyanamid on wheat, barley, sugar beets, potatoes, onions, and poppies during 1907 are reported.

Tests of the fertilizing value of synthetic calcium nitrate, N. Passerini (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. scr., 5 (1908), No. 3, pp. 388–392*).—In case of potatoes calcium nitrate and sodium nitrate were about equally effective in increasing the total yield and size of tubers. The two nitrates were about equally effective in increasing the yield of wheat.

New sources of nitrogen, D. A. Gilchrist (*County Northumb. Ed. Com., Bul. 11, pp. 62, 63*).—In comparative tests of calcium cyanamid, sulphate of ammonia, and nitrate of soda on mangel-wurzels it was found that the lime nitrogen gave poorer results in the dry season of 1905 and better results in the wet season of 1907 than the other nitrogenous fertilizers. In the case of oats in 1907 the lime nitrogen compared favorably with sulphate of ammonia. The fertilizers were used at rates furnishing 50 lbs. each of nitrogen per acre.

Results of fertilizer experiments with nitrogen lime, Bachmann (*Landw. Wchnbl. Schles. Holst., 58 (1908), No. 31, pp. 553–555*).—Comparative tests of nitrogen lime and sulphate of ammonia applied in the fall and in the spring on rye, oats, potatoes, and grass are reported.

The nitrogen lime gave the best results with winter grain when applied full ration in the fall about 8 days before seeding and harrowed in. The nitrogen lime was completely absorbed by the soil and was not washed out of sandy soils during the winter. A top-dressing with nitrogen lime on winter grain

gave good results when applied early in the spring. Fall application, however, is preferable. For summer crops the nitrogen lime should, if possible, be applied 8 days before planting and harrowed in. Its use as a top-dressing in this case is not to be recommended.

Experiments with lime nitrogen as a fertilizer, C. DUSSERRE (*Chron. Agr. Vaud, 21 (1908), No. 19, pp. 415–421*).—A number of cooperative experiments with farmers on cereals, grass lands, and potatoes are reported, the results in general showing that the lime nitrogen is a very efficient fertilizer on cereals and hoed crops, but is not well suited for top-dressing of grass lands.

Prize contest in trials of calcium cyanamid in comparison with other nitrogen fertilizers (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 5 (1908), No. 2, pp. 65–171*).—In order to obtain extensive data on the comparative value of various nitrogenous fertilizers this contest was established upon the following conditions: Diplomas of honor and cash prizes to the amount of $320 were offered. The cash prizes were 6 in number; one of $80 for comparative trials on a total area of not less than 2½ acres; 2 of $60 each for total areas of not less than 1¼ acres; and 3 of $40 each for total areas of not less than ¾ acre. The area of each plat on which calcium cyanamid was used was required to be not less than ⅛ acre. The nitrogen fertilizers to be compared with calcium cyanamid were to be the ones in use in the locality, and complementary fertilizers were to be used according to the needs of the crops or soils.

There were 16 entries, but reports were received from only 13. There are 9 reports each on wheat and corn, 5 on beets, 3 on potatoes, 2 on oats, and 1 each on flax, hemp, olives, and tobacco.

The results are varied and a detailed study of the reports is necessary to arrive at any definite conclusions.

Influence of soil humidity on the fertilizing action of calcium cyanamid, S. DE GRAZIA (*Staz. Sper. Agr. Ital., 41 (1908), No. 2–4, pp. 115–126; abs. in Chem. Zentbl., 1908, I, No. 26, p. 2198*).—A study of the effect of different degrees of moisture on the action of various chemical fertilizers is reported. The experiment was carried on in pots, each containing 2 kg. of air-dried earth. Three types of soil were used, namely, clayey, calcareous, and sandy.

The fertilizers used were calcium cyanamid, nitrogen lime, dicyandiamid, and sulphate of ammonia, and the different degrees of moisture used were certain percentages of the maximum quantity that each type of soil will retain by imbibition, as follows: 0, 10, 30, 60, and 90 per cent. The fertilizers were well mixed with the soil on April 25 except the sulphate of ammonia, which was applied in solution on May 19 and on May 21. Eleven selected seeds of rye were sowed in each pot. The degrees of moisture mentioned above were maintained from the time the fertilizers were applied until about 2 days before the sowing; then the pots were exposed to the air for nearly 2 days in order to have the earth in all the pots contain a like amount of moisture. Then such an amount of water was added as would give each type of soil 40 per cent of the quantity of moisture it would retain. This degree of moisture was maintained throughout the remainder of the experiment.

In the pots without fertilizer the effect of the higher degrees of moisture before sowing was shown especially with clayey soil. The calcium cyanamid gave better results with larger amounts of moisture, the largest being on clayey soil. The nitrogen lime showed a similar effect of moisture, but gave a smaller product. The different degrees of moisture had no effect on the dicyandiamid in any type of soil. The same is true of sulphate of ammonia.

In conclusion the author recommends that calcium cyanamid should be applied when the soil is wet or when there is good prospect of rain, and that in

any case it should be well worked into the soil, that it may have as much moisture as possible.

On the nitrification of calcium cyanamid in various types of soil, S. DE GRAZIA (*Staz. Sper. Agr. Ital., 41 (1908), No. 5–6, pp. 241–257; abs. in Chem. Zentbl., 1908, II, No. 12, p. 1060*).—This is a report of pot experiments on the nitrification of calcium cyanamid compared with sulphate of ammonia in sandy, clayey, humus, and calcareous soils. The results obtained are summarized as follows:

The nitrification of calcium cyanamid differs from that of sulphate of ammonia chiefly in the fact that until decomposition begins the cyanamid has a harmful effect on the micro-organisms of the soil. This is shown less in slowness of the action than in delay of its beginning.

This specific behavior of calcium cyanamid can not be considered as making it inferior to sulphate of ammonia, since no harm can result when the fertilizer is applied before the sowing.

The nitrification of calcium cyanamid begins and is completed much more rapidly in soils rich in organic material (nonacid) and in clayey soils than in sandy and limy soils.

Such marked influence of the nature of the soil probably depends on the degree of fermentation and especially on the absorptive capacity of each type of soil.

Absorption of calcium cyanamid in soil, H. KAPPEN (*Landw. Vers. Stat., 68 (1908), No. 5–6, pp. 301–331; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 556, II, p. 728; Chem. Zentbl., 1908, II, No. 9, pp. 818, 819; Chem. Abs., 3 (1909), No. 3, p. 351*).—From experiments with different kinds of soil the author concludes that the absorptive power of soils causes a decomposition of calcium cyanamid into lime, which is readily absorbed, and cyanamid, which is less readily absorbed. Cyanamid is also produced by carbon dioxid, and when these two agencies operate at the same time the production of free cyanamid is very rapid. This production of cyanamid produces a favorable effect on the growth of plants because the free cyanamid is more easily attacked by bacteria than the alkaline calcium cyanamid. In soils of low absorptive power the transformation of calcium cyanamid is slower and under these conditions germination and growth of plants may be injuriously affected by the undecomposed cyanamid compounds. The influence of absorption on the poisonous action of calcium cyanamid is therefore indirect and due to the fact that conditions favorable to the rapid conversion of poisonous compounds into harmless substances are thereby produced.

Experiments with calcium cyanamid and leucite as fertilizers for wheat and beans, I. BANDINI (*Atti R. Accad. Econ. Agr. Georg. Firenze, 5. ser., 5 (1908), No. 3, pp. 267–275*).—The results of the plat experiments reported show that the cyanamid was inferior to nitrate of soda as a fertilizer for wheat. In experiments with beans, leucite combined with mineral phosphate gave a larger crop and greater net return than potassium chlorid so combined.

On the causes that determine the liberation of potash in leucite in cultivated soil, L. BERNARDINI (*Staz. Sper. Agr. Ital., 41 (1908), No. 5–6, pp. 304–320*).—In central and southern Italy leucite occurs frequently and quite abundantly in soils of volcanic origin, and this study was undertaken to determine the possibility of utilizing leucite as a source of potash.

The author found that leucite yields its potash when shaken with solutions of sodium and ammonium salts. This action is a chemical phenomenon due to a reaction between the insoluble mineral and the salt in solution resulting in a double exchange of bases. This reaction in the case of ammonium salts is of importance in relation to the process of ammonification of the organic sub-

stance and the mineral parts of the soil. The organic substance of cultivated soil by a series of fermentative processes becomes mineralized and in this fermentative process the organic nitrogen is changed to carbonate of ammonia. The carbonate of ammonia, like other ammonium salts, reacts with the minerals of the soil, making insoluble its ammonia and thus protects it from the washing effect of rain.

The author has been able to demonstrate to his own satisfaction that by the action of the dilute solution of carbonate of ammonia upon leucite a compound is formed—ammonio-leucite—that contains ammonia in place of potash, ammonia that does not yield to water, but that can be easily set free by an alkali or by heat.

What are the laws controlling the assimilation of potash from the soil by plants? G. WIMMER ET AL. (*Arb. Deut. Landw. Gesell., 1908, No. 143, pp. 169; abs. in Mitt. Deut. Landw. Gesell., 23 (1908), No. 30, pp. 254, 255; Chem. Ztg., 33 (1909), No. 8, Repert., p. 32*).—This subject is discussed on the basis of long series of experiments with special reference to the utilization of the potash of the soil and of that applied in fertilizer, and with a view to determining the conditions under which potash manuring is likely to be profitable. The function of potash in plant life is explained, the method of the experiments is described, and the results are discussed in detail.

It is shown that the assimilation of potash from the soil by the plant depends in the first place upon chemical process, upon absorption of potash by the soil, upon soil moisture conditions, upon the season, and finally upon the fertilizing; in the second place upon the return of potash from the plant to the soil, the action of lower organisms, and absorption of potash by nematodes. The absorptive power of soils for potash increases the longer potash manuring is delayed. Fixation is more rapid in moist soils than in dry. Potash is therefore better utilized in a dry season than in a wet season, and assimilation is more evenly distributed throughout the growth of the plant. In absorptive soil, therefore, benefit is to be expected from potash manuring only when potash enough is supplied to more than satisfy the absorptive capacity of the soil.

The assimilation of potash is increased by liberal applications of nitrogen and phosphoric acid. The fact that many plants contain less potash when ripe than at the time of greatest growth is thought to indicate that some of the potash finds its way back to the soil. A considerable amount of potash is rendered available by lower organisms in the soil. On the other hand, it has been shown that nematodes take up a considerable amount of potash, which is thus rendered unavailable for the rest of the season. Treatment of the soil with carbon bisulphid by killing the nematodes releases this potash and thus benefits the crop.

While present knowledge does not furnish a basis for positive judgment in advance as to whether a given soil will benefit by potash manuring, chemical analysis, especially determination of potash-absorbing constituents, will aid field experiments to this end.

Comparative tests of the agricultural value of phosphoric acid of ordinary superphosphate, of dried and calcined phosphate and of metaphosphate of lime. M. DE MOLINARI and O. LIGOT (*Ann. Gembloux, 18 (1908), No. 9, pp. 499–503, pl. 1*).—This investigation was undertaken because it had been observed that many commercial superphosphates contained considerable amounts of calcium metaphosphate resulting from the heating of the monocalcium phosphate in the process of drying.

The experiments, which were made with oats grown in pots, show that in sandy clay soil under the experimental conditions superphosphate dried at 160° and superphosphate dried and calcined gave results similar to those obtained

with ordinary superphosphate. The action of phosphoric acid of metaphosphate, however, is decidedly inferior to that of the superphosphates. On sandy soil the effect of the dried and calcined superphosphates was less than that of superphosphate dried at 160°. It appears, therefore, that the character of the soil exerts an influence upon the assimilation of these forms of phosphoric acid.

The value of phosphoric acid in superphosphates and in Thomas slag, P. de Caluwe (*Engrais, 23 (1908), No. 45, p. 1075*).—A review of the investigations of de Molinari and Ligot referred to above.

The factors which influence the fertilizing effect of difficultly soluble phosphates, H. G. Söderbaum (*Landw. Vers. Stat., 68 (1908), No. 5–6, pp. 433–450; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 550, II, p. 728; Chem. Zentbl., 1908, II, No. 9, p. 819*).—Tricalcium phosphate and bone meal combined with nitrogen in different forms (sodium and ammonium nitrate, ammonium sulphate, and urea), and also with potassium chlorid and sulphate and sodium carbonate, were compared with superphosphate on oats and barley grown in cylinders containing 25 kg. each of sandy soil. See also a previous note (E. S. R., 17, p. 1053.)

On oats tricalcium phosphate gave slightly lower results with ammonium nitrate and slightly higher results with ammonium sulphate than with sodium nitrate. On barley receiving bone meal, ammonium nitrate gave lower results than sodium nitrate, ammonium sulphate reduced the yield 46.6 per cent, and a mixture of sodium nitrate and ammonium sulphate increased the yield (4.1 per cent) as compared with sodium nitrate alone. The addition of potassium sulphate to the tricalcium phosphate and ammonium sulphate gave somewhat higher results (with oats) than when potassium chlorid was used, but with bone meal and ammonium sulphate, potassium chlorid gave distinctly better results (with barley) than potassium sulphate.

In another series of experiments, ammonium salts (both nitrate and sulphate) were more effective than sodium nitrate in increasing the yield of oats when used with tricalcium phosphate and bone meal, respectively. Bone meal and ammonium nitrate gave higher results with barley than sodium nitrate and bone meal, while tricalcium phosphate and ammonium nitrate gave lower results. Both phosphates, but especially the tricalcium phosphate, gave much lower results with ammonium sulphate than with sodium nitrate. The addition of sodium carbonate (furnishing sodium equivalent to that of the nitrate of soda) to ammonium sulphate with bone meal gave a slightly (1.1 per cent) higher yield of barley than sodium nitrate and bone meal. With tricalcium phosphate, the addition of sodium carbonate with ammonium sulphate nearly doubled the yield obtained with ammonium sulphate and tricalcium phosphate, although the yield was still more than 50 per cent below that obtained with sodium nitrate and tricalcium phosphate.

With ammonium sulphate and phosphates, sodium carbonate very slightly reduced the yield of oats as compared with ammonium sulphate and phosphates alone.

While the author believes that the physiological reaction of the accompanying nitrogenous fertilizer plays an important part in determining the fertilizing effect of fertilizers, as stated by Prianishnikov (E. S. R., 18, p. 539) and others, many other factors, such as kind of plant, soil, and other fertilizing materials used, may mask or even reverse the influence of this factor.

Increase or decrease of nitrogen in the soil by manuring, D. A. Gilchrist (*County Northumb. Ed. Com., Bul. 11, pp. 26–29*).—It is shown that in experiments on grass land during 11 years the use of phosphatic fertilizers increased the soil nitrogen about 851 lbs. per acre over that of soil receiving no fertilizer. The plats receiving sulphate of ammonia and nitrate of soda in addition to the

phosphatic fertilizers contained less nitrogen than those receiving phosphate alone.

Note on the effect of lime upon the availability of the soil constituents, F. B. GUTHRIE and L. COHEN (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 61–66; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 889*).—For an abstract of other reports of this work see a previous note (E. S. R., 20, p. 125).

Concerning the influence of various relations between lime and magnesia on the development of plants, L. BERNARDINI and G. CORSO (*Staz. Sper. Agr. Ital., 41 (1908), No. 2–4, pp. 191–208*).—Culture experiments with rye, corn, and kidney beans are here reported. Rye and corn were cultivated in a nutritive solution containing per 1,000 cc. of distilled water: Nitrate of soda 1 gm., mono-potassium phosphate 0.5 gm., potassium chlorid 0.25 gm., calcium sulphate 0.5 gm., and iron chlorid trace. To this sulphate of magnesia was added in varying amounts to give the following proportions of lime to magnesia: 3, 2, 1, ½, ⅓.

Rye gave the best result in the solution in which the relation of lime to magnesia equaled 1, and better results with the higher proportions than the lower; corn gave the best result with the proportion of lime to magnesia equal to 2, and better with the higher than the lower, showing that an excess of lime does less harm than an excess of magnesia.

In the pot experiments soil of known composition was used and the proportions between lime and magnesia were made the same as in the nutritive solution experiments and the same results were obtained with rye and corn; with kidney beans the proportion of lime to magnesia equal to 3 gave the best result.

In field experiments with corn 6 plats were manured as follows: I, 535 lbs. of gypsum per acre; II, 356 lbs. of air-slaked lime per acre; III, 1,070 lbs. of sulphate of magnesia per acre; IV, 1,780 lbs. of sulphate of magnesia per acre; V, 178 lbs. of oxid of magnesia per acre; and VI, none. Plat V gave the best return, but the differences were not so marked as in the solution and pot experiments.

Cooperative fertilizer trials in Malmöhus County, Sweden, 1907, L. FORSBERG and M. WEIBULL (*Malmö. Läns K. Hushåll. Sällsk. Kvrtlsskr., 1908, No. 1, pp. 123–140, dgms. 2*).—Trials with different fertilizers for root crops, potatoes, small grains, etc., were conducted on 45 farms in southern Sweden on a plan similar to that followed in earlier years. The amounts of calcium carbonate and assimilable lime in the soils on which the fertilizer trials were conducted are reported.

Chemical manures in Italy, TOWSEY (*Dipl. and Cons. Rpts. [London], Ann. Ser., 1908, No. 4145, pp. 30–32*).—From statistics given in a bulletin of the Italian ministry of agriculture it is shown that the chemical fertilizers prepared in Italy are principally superphosphates and sulphate of ammonia. Of the former, about 800,000 metric tons of mineral superphosphate and 50,000 metric tons of bone superphosphate were produced in 1907. Of sulphate of ammonia about 10,000 metric tons was produced as a by-product of the gas industry and 100 metric tons from other sources. Of organic nitrogenous manures there was probably produced about 40,000 metric tons. There were in 1907 82 factories in Italy for the preparation of superphosphates, supplying practically all of this material consumed in Italy and a certain amount for exportation to neighboring countries. The sulphate of ammonia produced is about half of that required. In addition 41,900 metric tons of nitrate of soda, 7,000 metric tons of potash salts, and 100,000 metric tons of Thomas slag were imported in 1907.

The nitrogen question in Germany, N. Caro (*Die Stickstofffrage in Deutschland. Berlin, 1908, pp. 63, figs. 62; rev. in Bl. Zuckerrübenbau, 15 (1908), No. 15, p. 244*).—This is a second unrevised edition of this paper, which was presented before the Polytechnic Society of Munich in April, 1907. It discusses the need of nitrogen and the supply from various sources, particularly from the air; refers briefly to the Birkeland and Eyde process for making basic lime nitrate; and more fully describes the progress made in the manufacture of calcium cyanamid by the Frank and Caro process.

Valuation and extent of the nitrate of soda deposits of Chile, A. Bertrand (*Engrais, 23 (1908), No. 28, pp. 661, 662; Rev. Gén. Agron., n. ser., 3 (1908), No. 6–7, pp. 248–252*).—This is a summary of a report of the inspector appointed by the Chilean Government to investigate this matter. This report combats the idea that these deposits are rapidly approaching exhaustion.

The great nitrate fields of Chile (*Bul. Internat. Bur. Amer. Repub. (English Sect.), 27 (1908), No. 1, pp. 26–45, figs. 21*).—This article discusses briefly the extent, character, present output, and future possibilities of these fields.

Composition of some Chilean caliches, F. W. Dafert (*Monatsh. Chem., 29 (1908), pp. 235–244; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 13, p. 684*).—Analyses of 8 samples of caliche from widely different sources are reported and show that in all cases the water-soluble portion contained calcium, magnesium, potassium, sodium, nitrates, chlorids, sulphates, and iodates. "In most cases, perchlorates also were present; and in the 2 specimens richest in nitrates, small quantities of chromate were found. In no case did the soluble portion contain bromid, borate, nitrate, ammonia, carbonate, phosphate, or iodid. The specimens richest in sodium nitrate contained also much potassium nitrate."

Nitrate facts and figures, 1908, A. F. B. James (*London, 1908; rev. in Chem. News, 98 (1908), No. 2536, p. 11*).—The book gives statistical data regarding the mining and railway companies engaged in the nitrate industry.

Production of ammonium sulphate and gas from peat, A. Frank (*Ztschr. Angew. Chem., 21 (1908), No. 30, pp. 1597–1600; Österr. Chem. Ztg., 11 (1908), No. 16, p. 220*).—Reference is briefly made to a process by which moist peat may be economically converted into sulphate of ammonia and gas for power purposes. It is claimed that by this process 2,000 kg. of peat containing 50 per cent of water can be made to yield 2,800 cubic meters of gas of 1,000 horsepower hours and 40 kg. of sulphate of ammonia. The great economic importance of such a process is pointed out.

The nitrification of peat, J. P. Wagner (*Deut. Landw. Presse, 35 (1908), Nos. 55, p. 587; 72, p. 762*).—The utilization of peat for the preparation of niter beds according to the Bazin process (E. S. R., 20, p. 23) and in compost with sewage is discussed.

The nitrification of peat (*Deut. Landw. Presse, 35 (1908), No. 70, pp. 739, 740*).—The processes proposed by Wagner (above) are considered too expensive to be profitable under present conditions.

The nitrification of peat, G. Neuhauss (*Deut. Landw. Presse, 35 (1908), No. 57, p. 609*).—Earlier uses of peat in the preparation of niter beds than that of the process proposed by Bazin are noted, but such processes are considered impractical on account of their expensiveness.

On the utilization of the nitrogen of distillation residues, J. Effront (*Monit. Sci., 4. ser., 22 (1908), II, pp. 429–434; Österr. Chem. Ztg., 11 (1908), No. 21, pp. 285–288; abs. in Chem. Zentbl., 1908, II, No. 6, p. 548; Chem. Abs., 2 (1908), No. 18, p. 2597; Sucr. Indig. et Colon., 72 (1908), No. 11, pp. 328–331*).—Attention is called to the need of practical means of preventing the large losses of nitrogen which occur in distillery wastes, and the author describes a method of fermentation with yeasts in alkaline solution by which

it is claimed that almost the whole of the nitrogen is converted into ammonia and at the same time acetic and other acids are formed. Similar results were obtained by using pure or mixed cultures of soil organisms. The active agent in this transformation is thought by the author to be an enzym "amidase." One thousand kg. of molasses treated with cultures of garden soil which had been heated 1 hour at 70 to 80° yielded 75 kg. of ammonium sulphate and 95 to 120 kg. of acetic, propionic, and butyric acids.

The preparation and utilization of atmospheric nitrogen compounds, EYDE, WAGNER, and DUBISLAV (*Arch. Deut. Landw. Rats, 32 (1908), pp. 55–89*).—This includes discussions of the preparation of Norwegian niter by the Birkeland and Eyde process, the importance of the nitrogen of the air for practical agriculture, and the utilization of German water powers for the preparation of nitrogen compounds from the air.

The fixation of atmospheric nitrogen as cyanamid (*Nature [London], 78 (1908), No. 2021, pp. 273–275, figs. 6*).—The Frank and Caro process is described and reference is made to a number of new works which are being established to employ the process. It is stated that works are being constructed on the Canadian side of Niagara Falls "with a capacity of from 5,000 to 6,000 tons per annum, which it is hoped to enlarge later on so as to produce 40,000 tons."

On the formation of nitrogen oxid in high tension arcs, F. HABER and A. KOENIG (*Ztschr. Elektrochem., 14 (1908), No. 41, pp. 689–695; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 553, II, pp. 940, 941*).—This is a second paper on this subject (E. S. R., 19, p. 1023). Unusually high oxidation, 10 per cent in case of air and 14.5 per cent in case of mixtures of equal parts of oxygen and nitrogen, was obtained at temperatures above the melting point of platinum.

On the oxidation of nitrogen in cooled high tension arcs under reduced pressure, A. KOENIG (*Uber die Oxydation des Stickstoffes im gekühlten Hochspannungsbogen bei Minderdruck. Diss. Tech. Hochschule Karlsruhe, 1907, pp. 76, figs. 8*).—The introductory portion of this thesis discusses briefly the nitrogen cycle and the nitrate question; the theoretical part discusses the question as to whether nitrogen oxidation in the electric arc is of thermal origin. The same question is taken up in detail from an experimental standpoint in the fourth part. The general conclusion is reached that in cooled arcs there occurs purely electrical oxidation of nitrogen.

The manufacture of cyanamid in France, C. PLUVINAGE (*Jour. Agr. Prat., n. ser., 16 (1908), No. 36, pp. 298–303, figs. 4*).—This is a description of the factory which has been established at Notre-Dame-de-Briançon, Savoy.

On the formation of lime nitrogen, M. JACOBY (*Über die Bildung von Kalkstickstoff. Diss. Dresden, 1908, pp. 86; rev. in Chem. Ztg., 32 (1908), No. 64, Repert., p. 412*).—This records a study of the nature of the process of combination of nitrogen with calcium carbid both with and without the addition of other substances, and of the changes the product undergoes on standing.

On the fixation of nitrogen by calcium carbid, G. POLLACCI (*Ztschr. Elektrochem., 14 (1908), No. 36, pp. 565, 566; abs. in Chem. Ztg., 32 (1908), No. 84, Repert., p. 532; Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 836; Sci. Abs., Sect. A—Phys., 11 (1908), No. 131, p. 648*).—Tests of the effect of potassium carbonate and of varying pressure of the nitrogen on the process of its fixation with carbid are reported. The addition of the carbonate reduced the temperature necessary to fixation and yielded a product of greater fertilizing value (containing potash) than is obtained with the ordinary process.

Lime nitrogen and its manufacture, E. KEMPSKI (*Illus. Landw. Ztg., 28 (1908), No. 78, pp. 677–679, figs. 9*).—This is a brief general account of the manufacture of this product and of factories which have been established for its preparation in different parts of Europe.

Present status and tendencies of the electro-chemical manufacture of nitrate of lime (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 7, pp. 816–820*).—Processes of manufacture are described, possible improvements indicated, and the cost of production with present methods discussed.

The origin of potash deposits. E. ERDMANN (*Ztschr. Angew. Chem., 21 (1908), No. 32, pp. 1685–1702*).—The literature of this subject is reviewed.

The utilization of potash in industry and agriculture. P. KRISCHE (*Die Verwertung des Kalis in Industrie und Landwirtschaft. Halle, 1908, pp. 181, pl. 1, figs. 16*).—This is a compilation of information regarding the principal sources of potash, the development of the potash industry, the industrial and agricultural utilization of potash, and the outlook of the potash industry.

The use of crude potash salts in German agriculture in the years 1906 and 1902. SIEMSSEN (*Arb. Deut. Landw. Gesell., 1908, No. 147, p. XVI+24, map 1; abs. in Mitt. Deut. Landw. Gesell., 23 (1908), No. 36, p. 299*).—Statistics of the use of potash salts in agriculture in Germany are given in some detail, especially with reference to showing the extension of such use from 1902 to 1906. The total consumption of potash salts in the German Empire in 1902 was about 1,186,743.75 tons, in 1906 2,028,072.97 tons, or at the rate of about 140 tons per 10,000 acres of arable area in 1902 and 234.18 tons in 1906.

The phosphate of Thomas slag. V. A. KROLL, Jr. (*Stahl u. Eisen, 28 (1908), p. 675; abs. in Chem. Ztg., 32 (1908), No. 54, Repert., p. 354*).—It is reported that one of the principal constituents of Thomas slag is a hitherto unknown silico-phosphate, a double salt of lime and ferrous oxid with 5-basic phosphoric acid which crystallizes in hexagonal pyramids.

The phosphates of Florida (*Amer. Fert., 29 (1908), No. 4, pp. 5–9*).—An account is given of the history and present condition of the Florida phosphate deposits, with data as to the extent to which the different classes of phosphate have been exploited.

Phosphate in South seas. J. D. DREHER (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3274, p. 12*).—It is stated that deposits estimated at 50,000,000 tons occur in Ocean and Pleasant islands in the Gilbert group. Smaller deposits are reported from a number of other islands. A London company controls and is beginning to exploit the larger deposits.

The composition of the products of the eruption of Vesuvius in April, 1906. G. PARIS (*Staz. Sper. Agr. Ital., 41 (1908), No. 5–6, pp. 321–328*).—As a result of his own analyses and those of a number of other investigators, the author concludes that in the products of the eruption nitrogen compounds are found that form ammonia under the influence of a high degree of heat in the presence of soda or of lime, and he concludes further that these compounds are not stable, but undergo a slow decomposition, probably by bacterial action, as a result of which they yield ammonia.

The fall of volcanic material was injurious to crops then in the soil on account of its high degree of acidity (0.417 per cent calculated as hydrochloric acid), the large percentage of soluble salts (0.9 to 1.64 per cent of substance), and its weight. The material has, however, notably increased the fertility of the soil, since it has increased the proportion of potash, of phosphoric acid, and of nitrogen, and in some cases has also modified the physical properties of the soil.

Australian fish fertilizer. H. D. BAKER (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3310, p. 15*).—A brief account is given of the use of dead sharks and barracouta in apple orchards near Hobart, Tasmania. As the untreated fish is very offensive, a factory has been established for extracting the oil and preparing a dried fish fertilizer. This factory, which has been built on North West Bay near Hobart, has a capacity of 40 tons of raw fish per day. There is said to be an inexhaustible supply of fish in the vicinity.

In experiments made by a representative of the Tasmanian government in the preparation of the dried fish fertilizer a product was obtained containing 9 per cent of nitrogen and 5.77 per cent of phosphoric acid.

On the composition of the ash of a New South Wales seaweed, Ecklonia exasperata, and the percentage of iodin present, C. J. White (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 95–99*).—The ash of *Ecklonia exasperata* was found to contain potash 24.59, soda 18.15, lime 5.5, magnesia 5.19, phosphoric acid 0.75, sulphuric acid 14.98, chlorin 15.62, and iodin 0.89 per cent.

Analyses of soils, guanos, and other fertilizing materials (*Mem. Dir. Fomento [Peru], 1907–8, vol. 1, pp. 62–69*).—Mechanical and chemical analyses of a number of samples of soil from different parts of Peru, and chemical analyses of guanos and other fertilizing materials are given in tables.

Commercial fertilizers and chemicals, T. G. Hudson, R. E. Stallings, et al. (*Bul. Ga. Dept. Agr., 1908, No. 46, pp. 207*).—This report gives the text of the State fertilizer laws and rulings of the commissioner of agriculture under the law, general information relating to the culture and fertilizing of various crops, to methods of feeding stock and amount, and to character of feeding stuffs sold in Georgia, and analyses and valuations of 1,822 brands of fertilizers inspected up to August 1, 1907, representing estimated sales of about 840,000 tons.

The new Ohio [fertilizer] law (*Amer. Fert., 29 (1908), No. 2, pp. 10, 11*).—This law took effect November 1, 1908. Its enforcement is placed in the hands of the secretary of the State board of agriculture.

AGRICULTURAL BOTANY.

Botanical features of North American deserts, D. T. MacDougal (*Carnegie Inst. Washington Pub. 99, pp. 111, pls. 62, figs. 6*).—A description is given of the desert regions of North America, particular attention being paid to those between Texas and California and extending into Mexico. The geology of the region in the vicinity of Tucson, Ariz., is described, after which an account is given of the vegetation in that region. The temperature, water, and soil relations of desert plants are discussed at considerable length, after which the conditions contributory to the formation of deserts are described and their extent throughout the world traced.

Distribution of the roots of some annual cultivated plants, V. Rotmistrov (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 8 (1907), No. 6, pp. 667–705; 9 (1908), No. 1, pp. 1–24*).—The author has made a study of the vertical and lateral distribution of roots of a considerable number of plants of economic importance. The season's average growth of roots is shown in the following table:

Vertical and lateral distribution of roots in the soil.

Kind of plant.	Length of roots.		Kind of plant.	Length of roots.	
	Vertical.	Lateral.		Vertical.	Lateral.
	Cm.	*Cm.*		*Cm.*	*Cm.*
Barley, 2-rowed	120	90	Beans (Prineess of Orleans)	85	60
Barley, 6-rowed	111	86	Broad beans	110	84
Wheat	103	92	Do	110	90
Oats (Continental sort)	110	94	Poppy	102	80
Oats (Canary)	107	54	Flax	105	64
Rye	118	60	Camelina	104	96
Millet	105	110	Sunflower	144	120
German millet	106	92	Castor bean	120	100
Sorghum (black)	110	80	Cotton	95	104
Sorghum (yellow)	106	110	Potato	60	100
Maize	113	134	Beet	146	110
Peas	92	104	Cucumber	105	84
Beans (Glory of Lyon)	96	104			

Specialization and the origin of alternation of host plants in the Uredineæ. W. KRIEG (*Naturw. Wchnschr., 23 (1908), No. 36, pp. 561–573, figs. 5*).—A review is given of recent publications relating to specialization among certain species of rusts.

The present status of agricultural plant breeding. C. FRUWIRTH (*Med. Klinik, 4 (1908), Nos. 14, pp. 501–503; 15, pp. 541–543; 16, pp. 589–591*).—The history of plant breeding is briefly reviewed and the different methods of plant improvement by means of selection and hybridization are described. Mendel's law is considered in this connection and the use made of grafting is also noted.

Notes on bud mutations of Solanum maglia. E. HECKEL (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 15, pp. 615–617*).—For several years the author has been carrying on experiments with a number of species of Solanum to determine if possible the origin of the cultivated potato, and in the present paper he gives an account of the third generation of a bud sport of *S. maglia* that appears to have become fairly constant.

The author found that by growing this species in soils that were highly fertilized with chemical fertilizers and hen manure the plant was caused to mutate, producing tubers of various forms and colors. Where grown under other conditions, the plant showed no variation from the wild type. The third generation mutants grown alongside of ordinary potatoes showed very marked resistance to the Phytophthora disease, and the author believes that he has secured material not only of biological interest but also of practical value, since the new form appears to be adapted to wide variation in cultural conditions and is resistant to disease.

On the influence of wound stimuli on the formation of adventitious buds in the leaves of Gnetum gnemon. J. VAN BEUSEKOM (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 10 (1907), pt. 1, pp. 168–181*).—The occurrence of adventitious buds on the leaves of a specimen of Gnetum has been under observation for some time at Utrecht, and the author has undertaken to ascertain the cause of their abnormal development.

The formation of these buds was traced to punctures of a species of Aspidiotus. In their early aspect the abnormal tissues are yellowish, resembling in some degree the stigmonose of carnations, which has been shown by Woods to be due to aphid punctures (E. S. R., 12, p. 460). Unlike the carnation disease, there does not appear to be any irritating excretion on the part of the insect, and it is concluded that the leaf of *G. gnemon* may be stimulated to the formation of intumescences and hence adventitious buds by wounding, providing this is very slight, and that consequently the process is to be regarded as a reaction on the wound stimulus.

Some notes on grafting varieties of beans. L. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 2, pp. 142–144*).—The author found in experiments with 2 races of beans grown in Knop's solution that one was very subject to chlorosis, the leaves fell early, and flowering was retarded, while the other developed normally. He then made reciprocal grafts and found that the characteristics of the stock were transmitted in considerable degree to the graft. The chlorotic form when grafted upon the other developed normally and flowered early and abundantly. The form that was green and in every way normal when grown upon its own roots when grafted upon the chlorotic stock was affected with chlorosis, the leaves were poorly developed, and flowering was retarded. In addition to these gross differences, microscopic transformations were also noted.

A method for the quantitative determination of transpiration in plants. G. F. FREEMAN (*Bot. Gaz., 46 (1908), No. 2, pp. 118–129, fig. 1*).—A form of transpiration apparatus is described which is a modification and adaptation of

that used by Lamarlière and Verschaffelt. By its use, the transpiration of a plant under known and constant conditions can be accurately measured, and it is possible to demonstrate individual differences in the transpiration rates in different plants of the same species. This apparatus is designed for securing data as a basis for plant selection and breeding.

A new respiration calorimeter, G. J. Pierce (*Bot. Gaz., 46 (1908), No. 3, pp. 193–202*).—The author describes experiments with Dewar flasks, both silvered and unsilvered, in which the temperature of germinating peas, growing yeasts, etc., was determined. These flasks come in several shapes and appear well adapted for use as respiration calorimeters where the heat and energy of respiration are to be determined. For class use they are said to be decidedly better than any forms of apparatus commonly in use.

On endospermic respiration in certain seeds, F. Stoward (*Ann. Bot. [London], 22 (1908), No. 87, pp. 415–448*).—Experiments with barley, maize, and castor beans have been carried on to determine whether or not the cells of the endosperm possess vitality. The view generally accepted is that endosperms of Gramineæ possess vitality and are endowed with the capacity of autodigestion.

The experiments, which are described at considerable length, lead to the conclusion that the pure endosperm tissue of both barley and maize is capable of manifesting a gaseous exchange of a respiratory character. Whether this manifestation of respiratory activity is wholly or in part due to the vital activity of living protoplasm, or to the agency of respiratory enzyms, is yet undecided.

The evidence of the possession of vitality by the aleurone layer, which has hitherto been based on cytological and enzymic data, is substantiated by the results of the author's investigations.

The vitality and self-digestion of the endosperm of some Gramineæ, Diana Bruschi (*Ann. [London], 22 (1908), No. 87, pp. 449–463*).—This paper, which is an abstract of several preceding papers by the author, gives briefly accounts of experiments with maize, barley, wheat, and rye, which indicate that the starch endosperm of the grains investigated can digest itself in the absence of the scutellum and other parts of the embryo, although in different degrees. The self-emptying of the cells can go on in the absence of any vitality in the amyliferous cells, because the starch hydrolysis is accelerated by a strong amylase which arises, little by little, from a pro-enzym existing in the endosperm of the resting seed. This becomes active even though every trace of vitality has been removed from the entire endosperm or seed by mechanical means. The investigations further indicate that vitality is possessed by the aleurone cells situated in the periphery of the endosperm, and it is also retained in one or several subaleuronic layers whence it lessens by degrees until it disappears toward the middle of the endosperm, as well as in the part near the scutellum.

The influence of the concentration of sugar solutions on respiration, A. Maige and G. Nicolas (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 2, pp. 139–142*).—Investigations were made on the effect of various concentrations of glucose, levulose, saccharose, maltose, and lactose on the respiration of young bean seedlings deprived of their cotyledons and of etiolated seedlings of broad beans. The normal respiration was determined by the quantity of oxygen observed, and the intramolecular respiration by the carbon dioxid given off by the plants.

The intensity of the normal respiration was found to increase with the increased concentration of all the sugars, except for lactose. Where this form of sugar was used, there was a gradual increase in the respiration activity up to a concentration of 1 per cent, after which the intensity of the respiration

slowly diminished. The respiratory quotient increased with the concentration, always remaining, however, less than 1. The rapidity of growth, both in its energy and respiratory quotient, varied with each kind of plant and sugar investigated.

The energy of the intramolecular respiration increased progressively with the concentration.

The effect of increased concentration of solutions is twofold: It decreases the turgescence of the cells as the strength of solution is increased; it increases the penetration of the solution into the cells, the penetrative power being more active with the stronger solutions.

A physiological study of the development of fruits and seeds, W. Lubimenko (*Compt. Rend. Acad. Sci. [Paris]*, *147 (1908), No. 8, pp. 435–437*).—Experiments with *Colutea arborescens* showed an atmospheric pressure within the pods that was 0.15 to 0.26 atmospheres greater than that of the surrounding air, and analyses showed that the contained gas differed from that of the air. The carbon dioxid found in the growing pods apparently diffuses very slowly, and there is a greater or less accumulation of that gas within them.

When sections of the pericarp of Colutea, peas, and Lathyrus were so made as to permit the free exchange of gases, the seed failed to develop any further, and the pods usually dropped off the plant in 6 to 8 days. If the pods after sectioning were protected against drying, there was no development of the seed.

The experiments seem to show that a confined atmosphere is necessary for the normal development of these seeds, and that one of the functions of the pericarp is to maintain within itself an atmosphere of fairly constant composition.

A chemical study of the ripening of tomatoes, F. M. Albahary (*Compt. Rend. Acad. Sci. [Paris]*, *147 (1908), No. 2, pp. 146, 147*).—A study was made of the chemical changes taking place during the ripening of tomatoes, analyses being made of green fruits before the development of the seeds, green fruits when the seeds were fully formed, and fully ripe fruits. The author calls attention to the necessity of avoiding all oxidation and fermentation in investigations of this kind.

Detailed analyses are given, from which it appears that there is a progressive increase in the organic acids, sugars, starch, and nonproteid nitrogen during the ripening of the tomato, and a falling off in the percentage of the proteid nitrogen and cellulose. The proportions of the other constituents remained practically unchanged.

The physiological rôle of fat in plants, Dubaquié (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1906–7, pp. 92–96, dym. 1*).—The rôle of fat in plants has long been a subject of controversy, some investigators claiming that it is a form of reserve material, others that it is a product of elimination, etc. Experiments by the author with artificial cultures of *Aspergillus niger* and *Eurotiopsis gayoni* seem to indicate that fat is a reserve material which is drawn upon by the fungus at certain stages of development, particularly during spore formation. In experiments with Aspergillus, the maximum fat content was attained on the second day, after which it slowly decreased with the increasing dry weight of the mold. The occurrence of fat in plants is apparently not associated so much with the ternary compounds in the culture medium as it is with the age of the plant.

The effect of electricity upon plants, J. H. Priestley (*Proc. Bristol Nat. Soc., 4. ser., 1 (1906), pt. 3, pp. 192–203; abs. in Bot. Centbl., 108 (1908), No. 2, p. 36*).—An account is given of some experiments made by J. E. Newman in employing electricity as a stimulus to plant growth.

In experiments in 1904, 500 sq. yds. of kitchen garden were electrified by the overhead discharge system. The yields as compared with the control plats showed that cucumbers gave a gain of 17 per cent and strawberries from 36 to 80 per cent. Upon tomatoes there appeared to be no effect. An outbreak of a bacterial disease of cucumbers seemed much lighter upon the electrified plants.

In another experimental plat, carrots showed 50 per cent increase, and beets 30 per cent increase of crop with an increase of 1 per cent in sugar content.

In 1906, 20 acres of wheat were electrified with discharge wires at a considerable height and with a high tension current. In this case an increase of from 29 to 39 per cent over the control areas was recorded, and the electrified wheat is said to have given a better baking flour and commanded a higher price.

The author carried on some laboratory experiments to test the nature of the electrical acceleration of plant development, but no satisfactory clues were arrived at. There was nothing to indicate that the electric current enables a leaf to form starch in the dark, as is claimed by Pollacci.

Temperature and growth, W. L. Balls (*Ann. Bot.* [*London*], *22 (1908), No. 88, pp. 557–591, figs. 4, dgms. 7*).—The object of this paper was to analyze the effects produced upon the growth process by the temperature factor. The research was initiated by a casual observation, but it developed into an attempt to determine the chemical effects of the temperature factor by studying the pathological portion of the growth-temperature curve, and hence to demonstrate that the time factor is chemical in its nature and that its effects can be simulated immediately. After describing the methods of observation and tabulating the results of a large number of observations, the author arrives at the following conclusions:

"(1) The growth rate at various temperatures accords with the expectations of Van't Hoff's law.

"(2) The decrease, and ultimate cessation of growth at high temperatures, is due to the accumulation of catabolic products in the cells.

"(3) This cessation is distinct from the disorganization of the protoplasm by heat, which results on a further rise of temperature to the death point.

"(4) The same products are formed at low as at high temperatures, but with greater rapidity in the latter case.

"(5) To the rapid formation of these bodies is due the injurious effect of prolonged exposure to submaximal temperatures, commonly known as the time factor. This time factor is identical with the phenomenon of 'staleness' in rich cultures of fungi.

"(6) In the case of isolated cells these bodies diffuse out into the surrounding liquid. In multicellular organisms they have to be otherwise disposed of, probably by decomposition; since the conditions under which this decomposition takes place must be fairly uniform in the interior of a higher plant, these latter show in consequence a well-marked 'optimum,' which is the expression of the internal struggle between the increasing rapidity of chemical change with rise of temperature, and the inhibiting effects of the accumulating catabolic products."

As mentioned in the preliminary part of the work, this investigation was due to observed conditions in the infection of cotton seedlings with the sore-shin fungus. In a note appended to the paper, the author states that the artificial infection of cotton seedlings with the sore-shin fungus can be readily effected by placing the former on several layers of damp blotting paper in a Petri dish and then placing a fragment of rapidly growing mycelium from a cool culture in contact with it. If the dish is then stored at 20° C., within 24 hours the seedling will be found to have rotted at the point of inoculation. If the trial is repeated at a temperature of 33°, a brown superficial scar

is formed, but the fungus does not extend its attack into the inner layers of the cortex. At 38° no infection can be secured.

The influence of temperature on the action of poisons, L. Zehl (*Ztschr. Allg. Physiol., 8 (1908), pp. 140–190; abs. in Bot. Centbl., 108 (1908), No. 13, pp. 328, 329*).—A series of experiments with spores of *Aspergillus niger* and *Penicillium glaucum* were conducted to determine the poisonous action of a number of inorganic and organic compounds. Among the inorganic compounds used were aluminium sulphate, cobalt, copper, lithium, nickel, and zinc, as well as boracic acid and potassium chromate. Of the organic compounds, ethyl alcohol, amyl alcohol, chloral hydrate, acetanilid, antipyrin, phenol, picric acid, etc., were used.

The author found that raising the temperature increased the poisonous action of the inorganic compounds when used singly. In most cases the increase amounted to 3 times the initial toxicity, but for temperatures between 30 and 40° C. there was found to be no correlation between increased toxicity and increase in temperature, the toxicity increasing much more rapidly than the temperature. The organic poisons acted in a similar manner. No definite cause for this action could be determined, but the author believes that it can not be wholly explained by the increased ionization of the salts at the higher temperatures.

Where combinations of 2 inorganic salts were added to the culture media, the toxicity of the combined poisons was less than where the single salts were used. Where 2 organic or an organic and an inorganic poison were tested, the results were quite variable, the relative toxicity being increased in some cases while it was diminished in others.

Studies on germination and plant growth, S. U. Pickering (*Jour. Agr. Sci., 2 (1908), No. 4, pp. 411–434*).—According to the author, experiments have been in progress at the Woburn Experimental Fruit Farm on the effect of grass on trees, which have led to the conclusion that this effect can not be attributed to root competition, increased evaporation, differences in temperature, aeration, etc., but is due to some poisoning action exerted by the grass. Whether such action is a direct result of the growth of the grass, or an indirect one operating through the medium of soil bacteria, is the subject of the investigations here described.

The germination of a number of different kinds of seeds in heated soil seemed to indicate that the detrimental action of the grass can not be attributed to bacteria. Soils which were heated without drying to temperatures of from 60° to 150° behaved unfavorably toward the germination of seeds, retarding and in most cases decreasing the total germinations. Sterilized seeds with and without inoculation behaved in the same way as unsterilized ones, and, according to the author, the retarding effect of germination produced by heating the soil can not be explained by an alteration in the bacterial condition of the soil, for the alteration extends progressively at temperatures beyond that sufficient to destroy all bacteria.

By heating the soil an increase in the soluble constituents was found to occur, especially in the soluble organic and nitrogenous matter, and the increase of either of these was found to be directly proportional to the increase in the time required for germination. The increase in the soluble constituents appears to be due to the formation of a nitrogenous compound in the soil, which is inhibitory toward germination. This compound is sufficiently stable for extraction in solution, and it does not seem to be destroyed when the soil containing it is kept at a low atmospheric temperature for some months. The inhibitory substance is not of an acid nature, and the experiments do not settle definitely whether any of it is present in the soil before heating, but it

seems probable that such is the case. Preliminary experiments with apple trees under like conditions led to similar results.

The toxic property of bog water and bog soil, A. Dachnowski (*Bot. Gaz., 46 (1908), No. 2, pp. 130–143, figs. 6*).—During an ecological study of a small lake in Ohio, the author was led to give attention to the toxic character of bog water and bog soils. The lake in question is characterized by two well-marked plant zones, and investigations of water from each showed that it had marked toxic properties. The water from the central zone was decidedly more toxic than that from the other, but in both it could be corrected by aeration and by the use of calcium carbonate and carbon black.

Experiments were made on the germination of the gemmæ of *Marchantia polymorpha* and afterwards confirmed with water cultures of wheat, corn, beans, and elm and buckeye seedlings. The plants grown in the bog soil extract and in untreated bog water showed decided stunting in root growth, while the tops were more nearly alike. Marked differences in sensitiveness to the toxic action were shown by the different plants, the beans proving very plastic. The behavior of some of the plants was very similar to those grown in solutions containing strychnin, atropin, and similar substances.

The author believes that the inhibiting action of bog water and bog soils is due to plant substances that are soluble and which are probably the products of decomposition, plant excreta, etc. These substances by retarding oxidation, decrease transpiration and result in stunted growth, or even in the death of plants.

On plasmolysis, W. J. V. Osterhout (*Bot. Gaz., 46 (1908), No. 1, pp. 53–55*).—A discussion is given of the contraction of protoplasm within plant cells due to the chemical action of salts as distinguished from true plasmolysis. It is stated that the contraction of the protoplasm may often be prevented by the addition of substances to the nutrient solutions. Contraction caused by sodium chlorid may be prevented by the addition of a small quantity of calcium chlorid, although the osmotic pressure of the solution is greatly increased. Water distilled from a metal still was found to produce apparent plasmolysis within a few minutes, but this could be prevented by the addition of various inhibiting substances. It is believed by the author that many of the contradictory results attributed to plasmolysis are due to chemical action.

The concentration of green coloring matter in plants and photosynthesis, W. Lubimenko (*Rev. Gén. Bot., 20 (1908), Nos. 232, pp. 162–177, figs. 3; 233, pp. 217–238, fig. 1; 234, pp. 253–267, figs. 3; 235, pp. 285–297, pls. 2, fig. 1*).—Anatomical studies of leaves showed that the chloroplasts of shade-loving species of plants are larger than those of plants accustomed to grow in full light. The concentration of the chlorophyll was found to vary in different plants and in the same plant with the age of the leaves. In old leaves a greater absorption of light is possible, due to a considerable concentration of the coloring matter, and further it is probable that the limit of absorption for mature leaves is not reached under the usual conditions of illumination.

By means of spectroscopic analyses, the author was able to determine very accurately the variation in chlorophyll in the leaves of different species of plants at all stages of growth, and by a series of experiments he determined that the photosynthesis of the plant depends not only on the mass of the chloroplasts but on the concentration of the green coloring matter in the chlorophyll grains. In studies made with 9 species of plants at temperatures varying from 20 to 38° C. and at 3 different degrees of natural illumination, it was found that the maximum of photosynthesis does not coincide with the greatest concentration of the coloring matter in chloroplasts. The maximum assimila-

tion was found to correspond to a concentration of the pigment equaling that found in young leaves of shade-loving and old leaves of shade-shunning species. Adult leaves of tolerant species assimilate less energetically than adult leaves of those species which are intolerant of shade.

From a biological standpoint, the concentration of chlorophyll in the chloroplasts may be considered as a means for adapting plants to the different degrees of illumination found in their habitats. Tolerant species, by increasing the concentration of their pigment, are able to withstand a relatively feeble illumination, and a brightly lighted situation is injurious to intolerant species in so far as they are unable to vary the concentration of color in the chloroplasts. The intolerant species have a less concentrated chlorophyll in the natural state than the tolerant ones.

Does the chemical substance called chlorophyll exist? M. Tsvett (*Rev. Gén. Bot., 20 (1908), No. 236, pp. 328–331*).—The author presents arguments to show that what has been heretofore called chlorophyll is not a simple chemical substance, but is a mixture of 2 coloring materials, to which the names chlorophyllin α and chlorophyllin β are given. The first gives a blue color in a solution of ether and generally is 4 or 5 times as abundant as the second, which gives a green color when extracted with ether.

The influence of nutrition, water, and illumination on the development and organization of higher plants, Büngeр (*Naturw. Wchnschr., 23 (1908), No. 43, pp. 673–686*).—A summary and critical review is given of some of the more recent literature relating to the influence of nutrition, water, and light on plants.

FIELD CROPS.

Variety selection, seed culture, and plant breeding in Württemberg. C. Fruwirth (*Sorten, Saatfruchtbau und Pflanzenzüchtung in Württemberg. Plieningen, 1907, pp. 43*).—This publication in discussing varieties, selection, and dissemination touches upon the earliest work of this kind, the variety tests made before and after the establishment of the plant-breeding station, the distribution of the varieties in the country, and the varieties commonly grown. The history of seed production is reviewed, the promotion and direction of seed culture at the plant-breeding station is described, and notes on the different establishments making a specialty of seed and potato culture are given.

Under plant breeding the author discusses the development of breeding in Württemberg and other parts of Germany, and enumerates the farms which began plant breeding by themselves, as well as those which cooperated with the plant-breeding station. The methods of carrying on this work at the station are also outlined.

Report of the government agrostologist and botanist, J. Burtt-Davy, I. B. P. Evans, and H. G. Mundy (*Transvaal Dept. Agr. Ann. Rpt. 1907, pp. 132–148, 155–177*).—This report contains brief reviews of the different lines of work carried on during the year. Notes are given on veld or range improvement, the culture of a long list of miscellaneous crops, the prevalence of noxious weeds and poisonous plants, plant diseases and insect enemies, and the introduction of seeds and plants. In cultural tests with corn yields ranging from 1,200 to 4,000 lbs. per acre are reported.

Dry farming in Wyoming, V. T. Cooke (*Trans-Missouri Dry Farm. Cong. Bul. 1, pp. 13, pl. 1*).—A bulletin published by the State Dry Farming Commission and containing brief directions for farming dry lands in Wyoming.

Rules for the uniform seeding of grains for comparative botanical investigations (*Trudui Byuro Prikl. Bot., 1 (1908), No. 1–2, pp. 86–89*).—Rules are

given, through the application of which it is believed material for the study of morphological and biological varietal forms of grains may be secured.

Cereal and leguminous crops, M. P. CAVALCANTE (*O Brasil: Suas Riquezas Naturaes; Suas Industrias. Rio de Janeiro: Centro Indus. Brasil, 1908, Portuguese ed., vol. 2, pp. 277–319*).—The methods of culture practiced in Brazil and the general condition of the industry are described.

Report on tests with varieties of oats and barley at Garforth, 1907, R. S. SETON (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 71, 1907, pp. 13*).—The best varieties of white oats as determined by tests since 1900 were Abundance, Waverley, Tartar King, and Storm King. For rich land Tartar King and Storm King, two stiff sorts, are recommended and for land in a lower state of fertility, Abundance and Waverley. Of black varieties, Excelsior proved the best.

Taking both yield and quality into account, Standwell barley has proved the best on the average for the past 7 years, being closely followed by Goldthorpe, Brewers Favorite, and Chevalier in the order stated.

The water requirement of beets, rye, and barley on loam soil in 1907, C. VON SEELHORST (*Jour. Landw., 56 (1908), No. 2, pp. 195–198, pl. 1; abs. in Chem. Zentbl., 1908, II, No. 7, p. 631*).—This is a continuation of observations on the amounts of water evaporated and used by plants during their period of growth (E. S. R., 18, p. 629). It was found that 1 gm. of dry matter in barley required 504.5 gm. of water, in rye 307 gm., beets 461.8 gm. For the production of 1 gm. of dry matter in grain 1,225.7 gm. of water was required in case of barley and 854.2 gm. in case of rye.

The water requirement of lupines in the fall of 1906 and of potatoes, summer barley, and rye in the summer of 1907 on sandy soil, C. VON SEELHORST (*Jour. Landw., 56 (1908), No. 2, pp. 199–207; abs. in Chem. Zentbl., 1908, II, No. 7, p. 631*).—For the production of 1 gm. of dry matter in lupines 402 to 424 gm. of water was required, in potatoes 491 to 829 gm., summer barley 562 to 583 gm., and rye 763 to 1,093 gm.

The water content of grain furnished the German army from the crop of 1906 (*Arch. Deut. Landw. Rats, 32 (1908), pp. 485–506, dgms. 4*).—Tables are given showing the extreme differences in the water content of rye, oats, and wheat for each month from October to March, inclusive.

Recent observations on the culture of serradella and lupines on heavy soils, B. HEINZE (*Jahresber. Ver. Angew. Bot., 5 (1907), pp. 161–199, pls. 4, fig. 1*).—It was found that serradella and lupines, although typical plants for sandy soils, developed well under certain conditions on heavy soils and gave yields only slightly less than crops grown on sandy lands. A high lime content in a friable loam did not act injuriously upon either crop. Both made a poor growth after potatoes, oats, mustard, peas, and beans, and apparently had not produced any root nodules. On the other hand, a very good development was obtained of lupines following serradella and of serradella after serradella. These results were secured without any inoculation of the seed or soil.

Pure cultures were very effective in inoculating serradella on Lauchstedt soil in pot experiments, and gave better results in this regard than inoculation with soil in field tests. Inoculation with pure cultures in field experiments became effective rather late in the growth of the crop when numerous nodules appeared on the roots, but no increase in yield as compared with uninoculated serradella was obtained. The same results were secured with lupines where these had not been preceded by any leguminous crop.

In one field test where serradella was grown for the first time and no leguminous crop had immediately preceded it, inoculation with soil from an old serradella field was most effective in causing the production of nodules on the roots

and giving a remarkably high yield. The soil used in this instance was the friable Lauchsted loam, while on another plat where inoculation with a sandy soil from another serradella field had been made the yield was not materially increased.

The results are believed to favor Hiltner's view that the nodule organisms may be divided into two groups, of which one includes the organisms of serradella, lupines, and soy beans. The author further regards the work as showing the close relationship, if not the identity, of serradella and lupine organisms and that these may be readily substituted the one for the other. It is stated that these organisms are present in the Lauchstedt soil in forms not as yet quite adapted to the two crops but that such adaptation is in progress.

Classification of brewing barleys from a technical standpoint as well as their nitrogen content (*Ann. Sci. Agron., 3. ser., 3 (1908), I, pp. 297–328*).—A review is here given of the papers and discussions on this subject by Prior, Hubert, Cluss, and Wahl presented at the Eighth International Congress of Agriculture held at Vienna in 1907.

Investigations on the physical characters of barley from an anatomic-physiological standpoint. H. T. Brown (*Ztschr. Gesam. Brauw., 30 (1907), No. 18, p. 241; abs. in Zentbl. Agr. Chem., 37 (1908), No. 12, pp. 819–822*).—The author found that the fineness of the hull is correlated with mealiness of the grain. The thousand-grain weight of rough kernels was always greater than that of the smooth grain. The rough grains also had a greater volume than those of the finer varieties. The nitrogen content was found in general to increase with the degree of roughness in the hulls.

The distinguishing characters of two-rowed barley varieties. J. Broili (*Jour. Landw., 56 (1908), No. 2, pp. 121–139*).—The author discusses the classification of two-rowed barley varieties by means of the scar, the smooth base, the basal beard, the serrated character of the pair of nerves next to the keel in the outer glume, and by means of the lodicules. Plants of each of 16 varieties were examined.

The construction of the base of the kernel is considered a good factor in the classification of two-rowed barleys. The smooth flat base of the grain is a character of the nutans type or the open-headed varieties, while the other forms of the base indicate the erectum type or compact-headed sorts. It is also regarded as probable that the hairiness of the basal beard can be used as a distinguishing character for practical purposes. The author regards these characters of greater value in practice than for use in scientific work. Serrations on the nerves are not considered a reliable factor, although this character may be used in describing a race. The difference in the form of the lodicules is looked upon as a definite character by which nutans and erectum types may be distinguished.

Smooth-awned barleys. R. Regel (*Trudui Byuro Prikl. Bot., 1 (1908), No. 1–2, pp. 5–85*).—This article is a monograph on smooth-awned barleys which form a much more satisfactory forage crop than the rough or sharp-awned varieties. Botanical descriptions of 16 forms of the smooth-awned group are presented.

Enzyms in stored barley (*Wchnschr. Brau., 25 (1908), No. 39, pp. 557–559*).—The results of the investigations reported show that stored barley contains a diastatic enzym having the power of liquefying starch paste and partly turning the same to sugar. An enzym capable of inverting sugar was also found. These two enzyms are not equally distributed in the barley grain but are confined largely to the germ end. It is believed that the enzyms in stored barley become active when germination begins.

[Analyses of barley] (*Wchnschr. Brau., 25 (1908), Nos. 34, pp. 489–492; 36, pp. 517, 518*).—Descriptions of 61 samples of barley, including 9 from Bohemia and Hungary, the rest being of German origin, are given and their analyses tabulated. The descriptions have reference to the kernel only. The analytical data include moisture content, protein content, 1,000-grain weight, and the percentages of three different grades of kernels separated with sieves of 2.8, 2.5, and 2.2 mm. mesh.

Breeding agricultural plants, C. Fruwirth (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 9, pp. 449–468*).—This article, the fifth of a series on the breeding and improvement of certain agricultural plants, treats of the fodder beet and presents the results of breeding experiments conducted with this crop.

Covered single flower clusters and single branches of the flower-bearing parts set seed, but the seed bolls produced were lighter in weight than those grown under natural conditions on parts approximately of the same vigor. Covered flower clusters as compared with those developing in the open on the same part of the plant produced a smaller total weight of seed bolls, a smaller proportion as based on the number of flower clusters of well-developed seed bolls, and a larger proportion of poorly developed or dwarfed seed bolls. A number of well-developed fruits produced under cover yielded fewer plants than the same number produced in the open, and these plants under field culture also showed a lower average weight in the root and in the leaves. The weight of the seed bolls was found to increase rapidly from that part of any branch where blossoming begins and to decrease gradually toward the top where the bolls are light and small.

The heaviest seed boll on an upper branch was found to be lighter in weight than the heaviest boll produced on a lower branch. Selection of seed bolls according to their size gave in general the same results as selection according to weight. The largest seed boll, however, is not necessarily also the heaviest. The heavier bolls as a rule furnish the heavier seed. Culture experiments with light and heavy seed bolls did not show a definite relation between the weight of the seed boll and the weight of the beet produced, but it was ascertained that the heavier seed bolls produced a greater number of plants than an equal number of lighter seed bolls.

In crossing experiments the first generation in some instances showed variations in form and the influence of both parents was apparent. The spherical shape appeared dominant over the cylindrical form, pear shape over olive form, and scantiness of foliage over abundance of leaves.

Securing a stand of clover on the southern Iowa loess, E. B. Watson (*Proc. Iowa Acad. Sci., 14 (1907), pp. 177–186*).—A study was made of the influences governing the germination and early growth of clover on the loess and tilled soils of southern Iowa and of the action of manure on clover. The matter of securing a stand has been discussed in Bulletin 98 of the Iowa Station (E. S. R., 20, p. 230).

Experiments with horse, cattle, and mixed manures applied in pot culture tests in sterilized and unsterilized condition showed that sterilization had not lessened the benefit derived from the manure. Several tests of this kind were made, and from the results obtained it is concluded that the inoculation of this soil by means of manure is not necessary in alfalfa or clover growing. The results indicated that the bacteria in the manure had nothing to do with the growth of the clover, as this crop grew just as well without them.

In making a count of the number of bacteria in the soil treated in different ways it was found that the soil treated with manure contained a much greater number of bacteria than the check tests. It was thought that if the presence

of these bacteria is responsible for the better growth of the clover, the clover would suffer by their absence, and a series of experiments was carried on to throw light on this question. A summary of the conclusions drawn from the results secured is that bacteria were in no way responsible for the beneficial action of the manure on the growth of the clover because the sterile manure was as beneficial as the unsterilized, and further that when the whole pot was sterilized the crop did not suffer, but was even a little better than otherwise.

Mendelian studies of Egyptian cotton, W. L. Balls (*Jour. Agr. Sci., 2 (1908), No. 4, pp. 346–379, dgms. 3*).—The author concludes from his results that Mendel's law of heredity applies to all those characters of the cotton plant which have been critically investigated. No cases of coupling have yet been discovered which are likely to prevent the synthesis of the desired forms of cotton. Most of the characters of the plant fluctuate to some extent, but far less than has been commonly assumed. It is stated that the maximum length of the lint may be forced above the normal by special physiological conditions of the environment or the individual, but that it can not be depressed below that normal.

The cultivated varieties of cotton in Egypt are found to consist of innumerable different strains, and the deterioration which these undergo after a few years is due to this heterogeneity brought about by natural and unconscious artificial selection. The amount of cross fertilization in Egyptian cotton fields is given as not less than 5 per cent per annum nor more than 15 per cent. The accumulated effect of this annual crossing maintains the cotton crop as a mass of natural hybrids, and it aids in the depreciation of varieties when inferior strains are introduced by seed mixture. It was observed that many characters of cotton are intensified on crossing, but the causes of this phenomenon are as yet undetermined.

It is announced that the Khedivial Agricultural Society has founded the first official experiment station devoted to the utilization of Mendel's law for economic purposes.

Cotton, H. de Sá (*O Brasil: Suas Riquezas Naturaes; Suas Industrias. Rio de Janeiro: Centro Indus. Brasil, 1908, Portuguese ed., vol. 2, pp. 177–215*).—The methods of culture practiced in Brazil and the general condition of the industry are described.

Cotton growing and Nigeria, C. A. Birtwistle (*Proc. Roy. Colon. Inst., 39 (1907–8), pp. 80–104*).—This paper discusses the prospects of cotton culture in Nigeria and estimates that an area of 24,000,000 acres in that country is available for this crop. Labor, transportation, and market conditions are considered, and it is believed that an appreciable quantity of cotton will come out of Nigeria within 5 years of the opening of the Kano railway.

The effect of lime nitrogen on flax, C. Hoffmeister (*Flachs u. Leinen, 15 (1908), No. 170, pp. 3701–3703*).—The results of the experiments here reported indicate that lime nitrogen as a source of nitrogen for flax may be used with profit. It was found that not only the yield of seed was increased but that also the length of the stems and the yield of fiber were considerably augmented. With references to quality, lime nitrogen acted like other sources of nitrogen in that it increased the thickness of the fiber. The best results with this fertilizer are secured on a loose friable soil with the substance applied from 8 to 10 days before seeding.

[Varieties of oats on different types of soil and their composition], B. Sjollema and J. C. de Ruijter de Wildt (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1908, No. 4, pp. 1–43*).—In these experiments Probstei, Ligowo, Black President, Goldregen, Beseler II, Mesdag, and New Market oats were grown on marsh, moor, and newly broken heath soils.

On the heavy and sandy marsh soils about 2 bu. of seed was sown per acre, and on the moor and heath soils approximately 2.66 bu. The marsh soil was fertilized with superphosphate, and the low moor, sphagnum moor, and heath soils with Thomas slag, kainit, slaked oyster-shell lime, and nitrate of soda.

A heavy rain lodged the plats, and in this connection New Market, Beseler II, Goldregen, and Probstei were the most resistant sorts. On the sandy marsh as well as on the heath soil the crop lodged to a lesser extent than on the other soil types. Injuries from thrips were greatest on the heath plat, but Mesdag and Black President suffered little from this attack. Among the white varieties Goldregen was injured most and Probstei least. All sorts ripened latest on the heavy marsh soil and earliest on the heath soil.

The best results on the heavy marsh soil in the order of yield were secured from Goldregen, Probstei, and Beseler II. New Market gave the lowest yield of straw and the highest yield of grain, while Black President was one of the poorest yielders. On the sandy or light marsh soil the rank was New Market, Goldregen, and Ligowo, while on the low moor soil Probstei stood first, followed by Ligowo and New Market. On the sphagnum moor soil, which was quite sandy, Probstei led in yield, followed by Beseler II. The yield of grain for all varieties was low on the heath soil.

The heaviest weight per hectoliter on all soils was given by Black President and Goldregen. The different varieties, with the exception of Ligowo, showed a maximum difference in hectoliter weight of about 4 kg. (about 4.57 lbs. per bushel) on the different soil types. The highest average hectoliter weight was secured on the sandy marsh and heath soils, and the lowest on the heavy marsh and sphagnum moor soils.

The investigations on the weight of the different parts of the plants and their relation during different periods of growth seemed to have indicated that in different varieties grown under like conditions the relation of the weights of the different parts at maturity is constant. However, in the case of Probstei oats this constancy was not established.

A chemical study showed that relatively more organic nitrogen passes from the leaves than from the stems. The nitrogen content of the different varieties at maturity was practically the same for the stems, the leaves, and the heads. In early growth the differences between the nitrogen content of the 6 varieties was quite large, but from this period on there was a gradual approximation until later the difference was practically wiped out. The results further showed that the leaves and stems contributed a large part of their nitrogen content toward the development of the grain. On the sandy marsh and on the heath soil, the 2 types lowest in nitrogen, the development of the grain had drawn largely upon the nitrogen content of the leaves.

Beseler oats I, II, III, H. Dommes (*Mitt. Landw. Inst. Breslau, 4 (1908), No. 4, pp. 495–646, pls. 6, figs. 2, dgm. 1*).—This is a monograph on these varieties of oats. The history of their origin is related in detail, and the characters of the embryos of the 3 varieties are described. In addition the principal phases of growth with special reference to the morphological development of the parts of the plant above ground are discussed, and the yielding capacities of the varieties are compared.

Beseler I is adapted to mountain climates and matures rather late. The color of the straw and the grain is yellowish white. Beseler II may be profitably grown on rich valley soils in a high state of cultivation. It ripens early, stands up well, and is not injuriously influenced by heavy applications of nitrogenous fertilizers. The color of the straw and grain is a very clear white. Beseler III is a pronounced yellow variety, rather drought resistant, and well adapted to the continental climate of eastern Germany.

A list of 43 references to literature on oats culture and structure of the oat plant concludes the article.

Analysis of colonial oats, J. LEWIS (*Agr. Jour. Cape Good Hope, 33 (1908), No. 3, pp. 358–366*).—Tables are given showing the manner of treatment in culture tests and the yields per acre of 52 samples of oats obtained from various districts of Cape Colony. In addition, results of the chemical analyses of the samples are presented.

The peanut, J. ADAM (*Gouvt. Gén. Afrique Occident. Franç. Insp. Agr. 1908, pp. 206, figs. 46, dgms. 7, maps 3*).—This book devotes a chapter each to the origin and distribution of the peanut, varieties, culture and cultural requirements, products, commerce, growth of the industry, and economic importance of the plant.

Rice culture in Asiatic Russia, V. WALTA (*Tropenpflanzer, 12 (1908), No. 3, pp. 107–116*).—This article discusses in detail rice culture in the Russian Asiatic possessions, giving special prominence to lowland rice, although upland rice is also grown in some sections. It is estimated that the cost of producing an acre of rice amounts to about $14.61, and that with an average yield of about 1,923 lbs. of grain and 3,658 lbs. of straw per acre a profit of about $10.09 may be secured.

A report on experiments with potatoes, 1907, J. G. STEWART (*Unit. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 70, 1907, pp. 17, pls. 2*).—From the results of variety tests it is concluded that Midlothian Early and Ninetyfold are good early varieties, British Queen No. 2 and Dalmeny Radium medium varieties, and Up-to-Date, Dalmeny Regent, and Duchess of Cornwall good late varieties suited to cultivation in Yorkshire. Northern Star and Professor Maercker were the most disease-resistant varieties. Seed from Scotland and Ireland yielded much better than seed introduced from other parts of England, and the Irish seed gave a better return than the Scotch. The vigor of the potato has not been increased by growing the crop alternately on loamy and clay soils at Garforth. A dressing of wet sawdust over the sets at planting time apparently reduced the amount of scab. Sterilization of the soil prevented scab and greatly increased the yield.

Experiments with Solanum commersonii and S. commersonii violet, G. BOHUTINSKÝ-KRIŽEVCI (*Ztschr. Landw. Versuchsw. Osterr., 11 (1908), No. 7, pp. 655–662*).—The results of these experiments showed that *S. commersonii violet* is sensitive to large quantities of water in the soil and is no more adapted to wet soils than are the ordinary varieties of potatoes. It is also subject to plant diseases, being attacked by *Alternaria solani*. In quality it ranks with the ordinary potato, but it does not produce greater yields, the tubers are not larger, and they show a tendency to branch or to produce offsets. The author observed no character which differentiates this plant from the ordinary potato varieties.

The culture of Solanum commersonii violet, A. and P. ANDOUARD (*Bul. Sta. Agron. Loire-Inf., 1906–7, pp. 27–31*).—Two culture tests with this plant are reported, and the composition of the tubers is shown in tables. This crop grown in dry and humid soils in 1907 gave very small yields and the starch content of the tuber was comparatively low. The keeping quality also proved unsatisfactory.

The action of manganese on the potato and the beet, I. HENDRICK and E. CARPIAUX (*Bul. Inst. Chim. et Biol. Gembloux, 1908, No. 75, pp. 66–72*).—Soil relatively very rich was treated with superphosphate at the rate of 600 kg. per hectare (about 534 lbs. per acre), divided into 6 plats and planted with potatoes. Two plats served as check tests, two others received 10 kg. of sulphate of manganese per hectare (about 8.9 lbs. per acre), and the remaining two

50 kg. (about 44.5 lbs.). The results show that the application of 10 kg. of sulphate of manganese per hectare had no effect on the yield, while the use of 50 kg. increased the yield by 7 per cent.

A similar test was conducted on plats which had received no nitrogenous fertilizer and on others which had received 50,000 kg. of barnyard manure per hectare (about 44,500 lbs. per acre) two years before. Regarding the check test as 100, the yields of the plats without manure are represented by 104 where 10 kg. of sulphate of manganese was used and by 109 where 50 kg. were applied, while on the plats treated with barnyard manure these figures were, respectively, 105 and 111. From these results it is concluded that the action of the manganese on the yield can not be attributed entirely to the influence of this substance on the availability of the nitrogen of the soil.

On a number of plats of sugar beets receiving a general application of 500 kg. each of superphosphate, nitrate of soda, and kainit per hectare (about 445 lbs. per acre), several being treated with 10 and 50 gm. of sulphate of manganese per hectare, it was shown that this crop is not so favorably influenced by the application of manganese as the potato.

Plant food consumption of the beet during the first year of growth and its relation to the sugar content, K. Andrlík and J. Urban (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 10, pp. 559–575*).—Attention is called to the fact that owing to the influence of soil, seed, fertilizing, and weather the potash consumption of the beet may vary greatly. As determined by the authors the minimum consumption amounted to 156.9 kg. for 400 quintals (about 3.92 lbs. for 1,000 lbs.) of beets. As a rule the consumption is much higher. The quantity of potash taken up by the plant was increased through fertilizing with potash salts and barnyard manure.

Potash consumption is influenced by the amount of available potash present in the soil. In dry weather the beet uses comparatively little potash, even if heavily fertilized with the substance. Different kinds of seed, as well as the same kind of seed grown on different soils and in different years, also affected the potash consumption of the plant.

A heavy consumption of potash indicates a large leaf growth rather than an increased yield in beets and sugar. The authors found in the samples examined that the quantity of potash used in the production of 100 parts of sugar in the beet ranged from 2.1 to 5.8 parts. It was further shown that the greater percentage of potash is deposited in the leaves, the quantities found in the root ranging from 32.1 to 41.5 per cent of the total used by the plant. It was observed that where 400 quintals of beets used 156.9 kg. of potash, 100 parts of sugar corresponded to 0.75 part of potash, where 177.5 kg. were used to 1.01 parts, and where the potash consumption rose to 303 kg. to 1.72 parts. Variations due to the kind of seed ranged from 0.2 to 0.7 part of potash used per 100 parts of sugar produced.

Fertilizer experiments with seed beets (*Centbl. Zuckerindus., 16 (1908), No. 49, pp. 1320, 1321*).—The following fertilizer applications were made in the experimental culture of seed beets: Well-rotted and pulverized chicken manure and air-dry sugarhouse refuse 690 kg., sodium superphosphate 230 kg., dry wood ashes 460 kg., and nitrate of soda 230 kg. per hectare. The increase in yield per hectare for the different substances was as follows: Chicken manure on one plat 660 kg., on another plat 750 kg., sugarhouse refuse 270 kg., sodium superphosphate 310 kg., dry wood ashes 470 kg., and nitrate of soda 550 kg. These experiments were carried on in southwest Russia where chicken manure and wood ashes may be obtained at a relatively low cost, and in view of this fact these two substances were very much more profitable than the higher priced commercial fertilizers.

Assuming that the value of 100 kg. of beet seed is only 50 marks, the use of the quantity of chicken manure applied resulted in a net profit per hectare of approximately 335 marks (about $32.50 per acre). As the manure could be applied at an expense of 18 marks per hectare, this represents a profit of 1,958 per cent on the money expended.

Abnormally large beets. K. ANDRLÍK and J. URBAN (*Zischr. Zuckerindus. Böhmen, 32 (1908), No. 9, pp. 493–496*).—Analyses of abnormally large sugar beets disclosed a characteristically low sugar content, a high percentage of nitrogen, sodium, and chlorin, and a low percentage of phosphoric acid and iron oxid. As compared with fodder beets they were richer in sugar, poorer in reducing sugars, and very high in nitrogen content.

The sugar-beet seed breeding station of Wohanka and Company, Prague, Austria. C. W. DE REKOWSKI (*Detroit, Mich., 1908, pp. 43, pls. 8, fig. 1, dgm. 1*).—This station is described and some of the results of investigations carried on by H. Briem, the director, are reported. The method of modern sugar-beet seed breeding and growing is discussed.

Annual report of the bureau of sugar experiment stations. W. MAXWELL (*Ann. Rpt. Bur. Sugar Expt. Stas. [Queensland], 1907, pp. 46*).—A brief statement for 1907 of the work of the sugar experimental station at Mackay, of two substations in sugar districts, and of the laboratories, together with an account of the economic and financial conditions of the sugar industry in Queensland, is presented.

The results show that the varieties New Guinea 8A, 15 or Badila, 24 or Goru, 24A, and 24B still maintain the lead in sugar production. The first rattoon crop of the 10 best varieties grown with and without irrigation and with and without manures show that the average of the irrigated and nonirrigated plats with manures gave an increase of 9.3 and 10.7 tons of cane per acre, respectively, apparently due to the fertilizer applied. The largest increase due to manure was on the nonirrigated plats of New Guinea 24B, the increase being 15.4 tons per acre. The smallest difference in yield occurred on the nonirrigated plats of Bois Rouge, the increase on the manured plat being only 5 tons greater per acre than on the plat receiving no manure.

Deep subsoiling between the rows, with subsequent cultivation of the rattoons, increased the yield by 11.9 tons of cane and 1.7 tons of sugar per acre. In this experiment the plats were neither manured nor irrigated.

The outcome of distance experiments indicates that 1 plant with 3 eyes, with 6 in. between the plants in the row, is the best way of planting seed in the row. Any increase exceeding 5 ft. between the rows is likely to result in a lower weight of cane and yield of sugar per acre, while less than 5 ft. between the rows can result in an increase of cane and sugar.

Experiments with new varieties have brought out the fact that the best sorts are deficient in arrowing. A description of the introduced canes is given.

The stripping of sugar cane in Formosa. T. MURAKAMI (*Internat. Sugar Jour., 10 (1908), No. 118, pp. 478–484*).—Results of experiments in the stripping of sugar cane in Formosa indicate that this method of treatment for imported canes causes a decrease in sucrose together with a lowering of the purity coefficient, while at the same time the glucose and fiber are increased. This the author interprets as due to a chemical activity by which the nonsucrose is transformed into sucrose and sucrose into glucose. This chemical activity may be influenced by the presence of a large amount of salt absorbed with the water. The fresh food material thus obtained is expended in the growth of all canes except the colored canes.

A long exposure to the hot sun was found to increase the fiber content, but exceptions to this rule were the Formosan varieties and the Striped Singapore,

which are all rather hard in rind. Different kinds of manures applied did not seem to affect the results. The juice obtained from all canes from which the dry leaves were not stripped was slightly higher in sucrose content and coefficient of purity than the juice from the stripped canes. Rose Bamboo has proved a very promising cane. The results secured with this variety show that by stripping 4,445.76 lbs. per acre of cane were gained but 229.68 lbs. of sugar were lost.

Sugar cane, A. DE MEDEIROS (*O Brasil: Suas Riquezas Naturaes; Suas Industrias. Rio de Janeiro: Centro Indus. Brasil, 1908. Portuguese ed., vol. 2, pp. 105–175*).—The methods of culture practiced in Brazil and the general condition of the industry are described.

Acclimatization experiments with sweet potatoes, L. BERNEGAU (*Jahresber. Ver. Angew. Bot., 5 (1907), pp. 96–99*).—The results of analyses of sweet potato meal are given, and cultural tests with this crop in Germany are briefly reported. The attempts at growing sweet potatoes in Germany have thus far not been very promising.

Fertilizer experiments with tobacco, P. WAGNER ET AL. (*Arb. Deut. Landw. Gesell., 1908, No. 138, pp. 99*).—The results of cooperative fertilizer experiments with tobacco are reported in detail and general conclusions are drawn.

Plants grown with insufficient potash contained from 0.51 to 0.70 per cent of potash in the dry matter of the leaves, while this factor in plants overfed with potash reached 16.15 per cent. The maximum yield showed a potash content in the leaves of 2.3 per cent. It is stated that 7 per cent of potash in the leaves is not to be regarded as extraordinarily high. In the average of all experiments the fire-holding capacity of fermented tobacco leaves grown without potash fertilization was 25 seconds, as compared with 46 seconds for those having received potash.

Analyses and tests of 19 different samples to determine the relation between fire-holding capacity and potash content showed an average of 6.9 per cent of potash in the sample, with little variation for all samples tested. This potash content is regarded as normal and sufficient to insure a good burn. The average chlorin content of these 19 samples was 0.553 per cent, and it is concluded that tobacco leaves should not contain more than 0.6 per cent of chlorin, as a higher percentage interferes with the burning of the leaf. This combination of potash and chlorin was apparently very good, for in all 19 samples the fire-holding capacity was so great that the leaves once ignited burned completely. It is stated that as a rule heavy potash fertilization under like conditions produces a tobacco of better burning quality than light potash fertilization. It is pointed out, however, that the chlorin content of the leaf must not be high if this result is to be obtained. It was observed that with the use of fertilizers containing little chlorin the chlorin content of the leaf may be reduced to 0.1 per cent, while on the other hand if fertilizers high in chlorin are used the chlorin content of the leaf may reach 4 per cent. The conclusion is drawn that for good burning qualities tobacco should contain from 5 to 6 per cent of potash and not more than 0.6 per cent of chlorin.

The potash requirement of the tobacco crop per hectare for a yield of 1,500 kg. of dry matter in the leaf, corresponding to about 1,800 kg. of air-dried leaves and stems, was found to be about 120 kg. (about 106.8 lbs. per acre). To supply this amount it is recommended that 40,000 kg. of barnyard manure and 100 kg. of potash in a readily available form be applied per hectare. Without the barnyard manure an average of about 200 kg. of readily available potash will supply this demand. The experiments show, however, that where barnyard manure was applied alone about the end of April the chlorin content of the leaf was increased and the burning quality reduced. It is advised to

apply the manure in the fall in order that the chlorin may leach out during the winter. Attention is called to the fact that stock fed with beet leaves produce a manure high in chlorin, while feeding molasses or hay heavily fertilized with potash produces a manure rich in potash, so that in a measure the chlorin and potash content of barnyard manure may be controlled.

A comparison between sulphate of potash and silicate of potash, or martellin, showed 4.4 per cent of potash, 3.2 per cent of chlorin, and a fire-holding capacity of 4 seconds in the leaf grown with sulphate of potash, and 6.6 per cent of potash, 1.2 per cent of chlorin, with a fire-holding capacity of 60 seconds for the tobacco grown with the martellin.

The use of ammonium sulphate produced in all cases a greater fire-holding capacity than ammonium nitrate, the average results in 3 different tests being 41 and 34 seconds, respectively.

The nature of tobacco fermentation, H. JENSEN (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 15–16, pp. 469–483, dgms. 11*).—The results reported show that tobacco fermentation is not prevented by treating the leaf with corrosive sublimate, formol, or chloroform, and that fermentation is promoted by weighting down the mass and by fermenting in large bulks. Fermentation was found impossible in small quantities of tobacco, even though air was forced through them or they were inoculated with fermenting leaf. The effects of fermentation either in part or in their entirety were brought about by heating with steam from 10 minutes to 2 hours at a temperature from 90 to 100° C. Wet tobacco was brought to an active state of fermentation even when the bulk was small. Fermentation was impossible in tobacco which had been treated with steam as well as in leaf which had already gone through the process. Forcing oxygen through the tobacco to be fermented did not promote fermentation.

Tobacco, D. S. DE CARVALHO (*O. Brasil: Suas Riquezas Naturaes; Suas Industrias. Rio de Janeiro: Centro Indus. Brasil, 1908, Portuguese ed., vol. 2, pp. 231–275*).—The methods of culture practiced in Brazil and the general condition of the industry are described.

Observations on the breeding of Vicia faba, H. LANG (*Fühling's Landw. Ztg., 57 (1908), No. 14, pp. 481–497*).—The results of this work show that the most efficient factors on which selection in breeding may be based are the number of pods per plant, the length of the plant, and the size and light color of the seed. Selection according to the percentage of seed and the number of beans per pod produced remained without definite results. The weight of the beans per pod seemed quite constant and reliable, but the use of this factor is considered impracticable. It was further observed that progeny high in plant weight and yield of beans also ranked high in other important characters such as size and color of grain, number of pods per plant, yield of beans per pod, and length of plant.

Report on a test of varieties of wheat with notes on the weather at Garforth, 1907, R. S. SETON (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 69, 1907, pp. 13*).—The results of variety tests here reported indicate that Standard Red and Squarehead Master proved to be the best red wheats. Browick Grey Chaff, although a good yielding variety, was not so good in quality as these two, but on account of its greater strength of straw it is better adapted for land in good condition than either. White Standup, the only white wheat grown, was not so remunerative as the best red wheats, although characterized by stiff straw of medium length and well adapted to land of good quality. Duluth wheat also gave promising results. Squarehead Master, now grown for 9 years without change of seed, has shown no falling off in yield or in quality.

Correlations in the wheat stem of importance in breeding varieties resistant to lodging, K. ALBRECHT (*Landw. Jahrb., 37 (1908), No. 3–4, pp. 617–672, fig. 1*).—The factors studied as being of value in this connection were weight of spike, length of internode, weight of internode, thickness or diameter of stem, resistance to cross bending, and the anatomical structure of the stem, including among other features the area occupied by the fibrovascular bundles in a cross section of the stem wall.

The author concludes from his results that the relative weight of the straw, which he determined by calculating the weight of a section of the stem 1 cm. in length, is the most reliable indication of the strength of the cell structure upon which resistance to lodging depends. The determination of the resistance in cross bending tests, which stands in absolute correlation with the relative straw weight, is not considered so valuable on account of the somewhat crude methods of measurement in use. In practice, however, the resistance of the stem as determined by cross bending is considered as sufficiently accurate for the selection of individual plants for breeding purposes. The determination of the relative weight of the straw is regarded as too tedious and difficult for the plant breeder. While the thickness and the length of the internodes are characters much less reliable in detecting the interior development of the cells, they are believed nevertheless to be of value in selecting plants resistant to lodging.

The book of wheat, P. T. DONDLINGER (*New York and London, 1908, pp. XI+369, pl. 1, figs. 65, dgm. 1, maps 2*).—In the treatment of his subject the author devotes a chapter of the book to each one of the following topics: Wheat grain and plant, improvement, natural environment, cultivation, harvesting, yield and cost of production, crop rotation and irrigation, fertilizers, diseases, insect enemies, transportation, storage, marketing, prices, milling, consumption, production and movement. The bibliography given occupies 27 pages.

A short wheat survey of Bengal, D. N. MOOKERJI (*Dept. Agr. Bengal, Dept. Rec., 1907, No. 2, pp. 19, pls. 2*).—The botanical relations of the wheats grown in Bengal, the names and relationships of the different races, the foremost important races of Bengal wheat, the distribution of varieties, the culture of the crop, the composition of the grain, and statistics with reference to production are discussed.

The content of important plant food ingredients in some common weeds, A. STUTZER and L. SEIDLER (*Fühling's Landw. Ztg., 57 (1908), No. 12, pp. 429, 430*).—The authors report the results as determined by analyses given in the following table:

Plant food contained in the dry matter of some common weeds.

Kind of weed.	Ash.	Nitrogen.	Phosphoric acid.	Potash.	Sodium.	Calcium.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Sonchus oleraceus	14.95	2.39	0.88	4.77	2.16	1.94
Centaurea cyanus	8.12	2.30	.78	1.94	1.07	3.13
Spergula arvensis	10.12	2.36	1.08	4.21	1.91	1.52
Serradula arvensis	9.68	1.91	.76	2.22	1.02	3.07
Raphanus raphanistrum	5.22	1.85	.78	1.30	.71	1.81
Polygonum persicaria	10.58	3.12	1.16	3.12	2.53	4.93
Achillea millefolium	9.61	2.30	.93	3.15	1.17	3.84

Testing seeds by means of electricity, T. JOHNSON (*Jahresber. Ver. Angew. Bot., (1907), pp. 102–112, figs. 3*).—A method to estimate the vitality of seeds by electricity, in which the blaze current is used as the indicating factor, is described in detail and the results of testing seeds of different grades of vitality are given.

HORTICULTURE.

Recent investigations on the grafting of herbaceous plants, E. Griffon (*Bul. Soc. Bot. France, 55 (1908), No. 5, pp. 397–405, pls. 2*).—In continuation of previous work (E. S. R., 19, p. 37) grafting experiments were conducted with the Solanums and other herbaceous plants to study the influence, if any, of the stock on the graft and vice versa.

As previously reported, grafting does not appear to exert any specific or unusual influence on the immediate fruit of the grafted plants, and, as indicated by one year's results with tomatoes, seedlings grown from fruits of grafted plants comport themselves in the same manner as those grown from fruits of ungrafted plants. The work is to be continued.

The culture of early vegetables: The rôle of glass sashes, G. Castet (*École Agr. Algér. Maison-Carrée, Inform. Agr. Bul. 6, pp. 52, figs. 60, map 1*).—A popular account of forcing methods used in growing early vegetables in southern France.

Climate, soil, and, fruit culture, A Bechtle (*Klima, Boden und Obstbau. Frankfurt, 1908, pp. XX+557*).—This book is designed as a reference work for the German fruit grower. It contains in concise form the knowledge gleaned from recent climatic and soil investigations which have a bearing on fruit culture. The numerous topics under which the subject-matter is treated are grouped under three general headings as follows: The climate, the soil, and phenology. The results secured in the fields of plant physiology and agricultural chemistry are also included as being closely related in fruit culture to many questions of a climatic nature.

The appendix deals with climatic and other conditions of North American orchard districts in comparison with German conditions. A bibliography of works consulted is given.

On fruit culture in Finland, B. W. Heikel (*Landthr. Styr. Meddel., 1907, No. 56, pp. 51, pls. 12*).—A report on the general condition of Finnish horticulture, together with discussions of varieties of apples, pears, cherries, and plums, grown in Finland.

Commercial apple culture in mountain regions, W. N. Hutt (*Bul. N. C. Dept. Agr., 29 (1908), No. 8, pp. 3–29, figs. 4, dgm. 1*).—A popular bulletin in which consideration is given to the adaptability of mountain regions to apple culture with reference to temperature and moisture conditions, atmospheric drainage, frost protection, etc., and discussing the various phases of apple culture, including selection of site, soils, planting operations, varieties, cultivation, fertilizers, cover crops, protection from mice and rabbits, and spraying.

Strawberry culture, F. A. Waugh (*Mass. Crop Rpt., 21 (1908), No. 6, pp. 30–39, figs. 4*).—A popular article on strawberry culture, treating of soils and localities, propagation, planting, general culture, mulching, methods of management, fertilizers, diseases, insects, varieties, and marketing of crops.

The influence of the color of soil on the growth and fruitfulness of grapes, L. Ravaz (*Ann. École Nat. Agr. Montpellier, n. ser., 8 (1908), No. 1, pp. 22–45, figs. 4*).—The author cites from several writers relative to the influence of the color of soil on the growth and fruit production of grapes and gives an account of investigations started along this line in 1906, with the results thus far secured.

An experimental plat containing 99 vines was covered with a concrete made up of water, lime, and basic slag from 4 to 7 cm. (about 1.6 to 2.8 in.) in depth, a small clear space being left at the base of each plant to insure the penetration of rain water. The covered portion was colored, ⅓ being white, ⅓ red and ⅓ black to correspond with different types of vineyard soils. The check

plat in each case was a grayish soil cultivated in the usual manner. The data secured show the vine growth to have been greatest on the black plat and least on the white plat. The growth started at the same time on all of the plats, but the growth on the red and black plats quickly surpassed that on the check plats. The growth on the white plat was slower than on the other colored plats and continued throughout a longer period. Measured by the yield of fruit, however, the white plat was first and the black plat third. The white plat appeared to have suffered least from a prevailing drought and the soil was found to contain a greater moisture content, from which the author advances the opinion that the drying out of soil may depend more upon the vegetative growth produced, which was least in the white plat, than upon the tilled or untilled condition of the soil.

In connection with this investigation the soil and air temperatures of the plats were taken almost daily from March 9 to November 30. The color of the soil did not appear to modify either the maximum or minimum air temperature. The soil temperature, however, at a depth of 10 cm. was much higher in the red and the black plats than in the check or in the white plats, and as far as this experiment is concerned the growth activity appeared to increase with the increase in soil temperature.

The reconstitution of limy soils, P. Sagourin (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 45, pp. 555–562*).—The comparative results are given of tests of 2 grape hybrids, *Mourvèdre-Rupestris* 1202 and *Chasselas-Berlandieri* 41b, used as stocks on calcareous soils and upon which were grafted 6 varieties of grapes. Grapes grafted on the former had a much more vigorous growth than those grafted on the latter, which growth appeared, however, in some cases, to influence the quantity and quality of fruit unfavorably. Vines grafted on *Chasselas-Berlandieri* 41b matured quicker and the fruit attained as a rule a higher sugar content. This stock is especially recommended for plantations producing fine wines.

Recent investigations on the shallow culture of grapes, L. Ravaz (*Ann. École Nat. Agr. Montpellier, n. ser., 8 (1908), No. 1, pp. 5–21, figs. 6*).—In continuation of previous investigations on shallow culture (E. S. R., 17, p. 866), experiments were conducted in 1906–7 in which shallow culture was compared with deep culture in a vineyard in which the vines were stunted and suffering with short nodes.

The test plats had previously been fertilized and drained, but no considerable increase of vigor was noted either from the drainage or from any of the fertilizer ingredients, with the exception of nitrogen, which appeared to stimulate the growth somewhat. Shallow culture, however, had a decided beneficial influence on the vine growth and on the fruit production. The benefit is attributed chiefly to the encouragement and protection of surface-feeding roots. Similar results were secured at Geisenheim by the use of a mulch of basic slag. In the latter case the roots were not only protected, but the slag furnished a certain amount of plant food to the vines.

Investigations relative to the influence of the condition of the surface of the soil on the temperature of the air and of the soil showed the air to be warmer above level, shallow-tilled soil than above rough plowed soil. Newly plowed, moist soil cools the atmosphere to a considerable extent. The temperature at the base of the vines is higher than above the ridges between the rows. Level shallow culture starts vegetation earlier in the spring. Although the new growth is exposed for a longer time to spring frosts, these frosts are not so severe as on the cloddy soils. In order to lessen the danger from spring frosts it is suggested that soils should be left in a rough condition until growth starts,

and that when the buds begin to swell the surface of the soil should be either harrowed or rolled. Since grass and weeds play the same rôle as rough clods, they should not be cultivated out until the buds swell. Throwing the dirt away from the vines will also serve to retard growth.

The fertilizer requirements of grapes, G. Chiepaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre)*, *29 (1908)*, *No. 44*, *pp. 517–522*).—The results are given of analytical studies made with grapevines and the fruit at six different periods during the growing season with a view of determining a suitable fertilizer for grapes as indicated by the amount of nitrogen, potash, phosphoric acid, and lime removed from the soil.

The data obtained show that about three-fourths of the total amount of nitrogen and five-eighths of the total amount of potash are taken up from the time growth starts to the flowering season. The absorption of these elements practically ceases when the fruits begin to show color. The phosphoric acid appears to be taken up almost entirely before the flowering season. Lime is taken up quite regularly throughout the growing season, the amount increasing as growth advances. It is estimated that a hectare (2.47 acres) of grapes removes from the soil annually from 40 to 80 kg. of nitrogen, 8 to 20 kg. of phosphoric acid, and 30 to 80 kg. of potash.

The origin of the red color in grapes, J. Laborde (*Bul. Assoc. Chim. Sucr. et Distill.*, *26 (1908)*, *No. 1–2*, *pp. 76–78*).—Red colors may be produced artificially in the leaves and fruits. The author has produced a red liquid from white grapes by heating in an autoclave at 120° for 30 minutes in a 2 per cent solution of hydrochloric acid.

The origin of red colored grapes, P. Malvezin (*Compt. Rend. Acad. Sci. [Paris]*, *147 (1908)*, *No. 7*, *pp. 384–386*).—Further experiments on the subject noted above. The author thinks the red coloring in nature is brought about by the combined action of air, light, heat, and diastase. In white grapes the diastase may be absent and the color can not be produced at ordinary temperatures, and therefore the red color may be produced from white grapes only when the temperature is raised artificially.

The transformation of the coloring matter in grapes during ripening, J. Laborde (*Compt. Rend. Acad. Sci. [Paris]*, *147 (1908)*, *No. 17*, *pp. 753–755*).—Determinations of the soluble, insoluble, and total coloring matter in grapes of different sorts at different stages of development are reported.

Tea on the Congo (*Bul. Off. Etat Indépend. Congo*, *24 (1908)*, *No. 10*, *Sup.*, *pp. 327–336*).—Data are given on experiments in growing and manufacturing tea at the Eala Botanic Garden. The results as a whole indicate that tea can be successfully grown in that region.

[Investigations in selecting and breeding opium poppies], J. M. Hayman (*Rpt. Cawnpore [India] Agr. Sta.*, *1907*, *pp. 14–17*).—Work is being conducted at the station in determining the extent to which the offspring of seed selected from highly productive opium poppies reproduces the same indications of high production. The results of the first year's work are presented in tabular form.

Seed was procured from selected parents producing from 4 to 6 grains of opium as against 2 and 3 grains in other cases. Comparing the average opium yield per plant of 1,120 seedlings with that of the average opium yield per plant of 14 parent plants, the progeny showed a decrease in yield of only about 1 grain. The work is to be continued.

The stability in type of different varieties of poppies was also tested, with special reference to the influence, if any, of cross-fertilization by bees. The results indicate that the types are distinct varieties and that bees have not thus far effected cross-fertilization. Studies of the growth of poppy plants lead

to the conclusion that the number of capsules per plant depends almost entirely on the condition of the land and the space allowed for the development of each plant.

FORESTRY.

The hardy conifers of Central Europe, E. SCHELLE (*Die Winterharten Nadelhölzer Mitteleuropas. Stuttgart, 1909, pp. VIII+356, figs. 171, pl. 1, map 1*).—This is a handbook for gardeners and garden lovers in which the author presents in concise form, aided by illustrations, the distinguishing characteristics of the native and exotic species and ornamental varieties of conifers adapted to the German climate. Consideration is also given to the habitat and morphology of conifers, together with cultural practices and methods of propagation.

Form and content of the fir, A. SCHIFFEL (*Mitt. Forstl. Versuchsw. Österr., 1908, No. 34, pp. 96*).—This is the fourth of a series of form and volume tables for conifers which the author has prepared by the form quotient method (E. S. R., 18, p. 1052). The tables for white pine have been noted (E. S. R., 19, p. 746), and similar tables for spruce and larch have been published.[a] The author is of the opinion that all other conifers can be cubed with sufficient accuracy by using the tables for one of the above-named kind. The form quotient method, however, can only be applied with safety to deciduous trees in computing the value of the bole up to where the crown starts.

Notes on the growth of pine trees at Greendale, T. W. ADAMS (*Canterbury Agr. and Pastoral Assoc. Jour., 10 (1908), No. 5, pp. 115–117*).—Brief notes are given on the growth of some 50 species of pine on the author's plantation in New Zealand. *Pinus laricio, P. coulteri, P. insignis,* and *P. ponderosa* are especially recommended for planting in that country.

Seeds of Lophira alata from Sierra Leone (*Bul. Imp. Inst., 6 (1908), No. 3, pp. 243–245*).—Analyses are given of the seeds of *L. alata*, a tree already known as one of the sources of the so-called African oak.

The seed was tested relative to its value as an oil seed. The fat content ranged from 31.19 per cent to 43 per cent, and the oil was valued by a soap manufacturer at about $5 to $10 per ton more than cotton-seed oil under ordinary market conditions. It has not as yet been determined at what price the seed can be marketed.

Timbers from Uganda (*Bul. Imp. Inst., 6 (1908), No. 3, pp. 227–239*).—Descriptions are given of over 50 Uganda timbers including several new species and genera relative to the wood structure and probable economic value of each.

On hardness tests of wood, G. JANKA (*Centbl. Gesam. Forstw., 34 (1908), No. 11, pp. 443–456, fig. 1*).—In a previous experiment the author determined the relative hardness of several kinds of wood by pressing into the wood, both radially and longitudinally, a small half-ball shaped iron die (E. S. R., 18, p. 341). A similar experiment is here reported, including the tabular results, in which the resistance of the wood of both conifers and hardwoods to the ball-shaped die was compared with its resistance to a cone-shaped die making the same sized impression at the surface of the wood.

As in the former experiment, an increase in the specific gravity of the wood was accompanied by an increased hardness. In all cases the hardness numbers with the ball-shaped die were greater than with the cone-shaped die, side impressions with the ball-shaped die giving the highest hardness numbers and end impressions with the cone-shaped die giving the lowest. The differences

[a] Mitt. Forstl. Versuchsw. Österr., 1899, No. 24; 1905, No. 31.

between the 2 dies, however, were quite variable even in the same species of wood. The author concludes that the cone-shaped die is best adapted to the testing of metals and homogeneous substances and that the ball-shaped die is more suitable for testing the hardness of wood. The author points out the simplicity of this impression method of testing the strength of wood as indicated by its hardness, and is of the opinion that it can largely take the place of the comprehensive bending and compression tests when suitable machinery is made for the purpose.

Tests of treated timbers (*Engin. News, 60 (1908), No. 13, p. 348*).—Extensive tests of the physical properties of timber that has been treated by preservative processes were conducted during the year by S. M. Rowe, and the results are to appear as a supplement to his Handbook of Timber Preservation (E. S. R., 17, p. 775). Two tables are here given which indicate the general results secured. Table 1 shows the ultimate crushing loads and other properties of some treated and untreated specimens, and Table 2 summarizes the results of tests on the absorptive properties of timber.

Report on the lumber industry in the Russian Far East, Hodgson (*Diplo. and Cons. Rpts. London, Misc. Ser., 1908, No. 670, pp. 12, map 1*).—This report contains a brief discussion of the forest areas of Eastern Siberia and Manchuria, the present status of the lumbering industry, the kinds of lumber, forest control and taxation, together with the regulations and scale of export duty in force in the Manchurian forest.

The estimated forest area in the Amur and Maritime Provinces is 509,000,000 acres, of which 19,000,000 acres belong to the Cossack administration.

Ceara rubber from Portuguese East Africa (*Bul. Imp. Inst., 6 (1908), No. 3, pp. 255–259*).—Analyses are given of 11 samples of plantation Ceara rubber from Portuguese East Africa, together with data on their preparation and notes on their commercial value. The results show that Ceara rubber of satisfactory quality and value can be produced in that country.

The length of the germinating period of Funtumia elastica seeds and method of preparing the fruits for shipment (*Bul. Off. État Indépend. Congo, 2½ (1908), No. 10, Sup., pp. 336, 337*).—When *F. elastica* fruits were stored at the Eala Botanic Garden for 8 months from the time of harvest, 45 per cent of the seed which was then sown germinated, whereas of seed which was decorticated and packed in charcoal, humus, sawdust, etc., only 12 per cent germinated at the end of one month after harvest. As a result of this investigation it is recommended that *F. elastica* seed be shipped in the whole thoroughly dried fruit either in tin cases or wooden boxes which should be left unsealed, in order to prevent sweating during the trip.

Rubber of Forsteronia floribunda from Jamaica (*Bul. Imp. Inst., 6 (1908), No. 3, pp. 259, 260*).—A sample of rubber of the *F. floribunda* vine, growing in the limestone districts of Jamaica, showed a crude rubber content of 79.3 per cent and a true rubber content in the dry rubber of 89 per cent.

Although the quality is good and the rubber readily salable the supply thus far has been irregular and small.

The science of Para rubber cultivation, II. Wright (*Colombo, Ceylon, 1907, pp. 97, pls. 4*).—This is a series of lectures with the discussions following, delivered by the author on various occasions in Ceylon and London. The following topics are included: Distance in planting and pruning (E. S. R., 18, p. 148); nature of the Para rubber tree and latex extraction; rubber cultivation and future production; rubber tapping demonstration; distance and interplanting (E. S. R., 18, p. 811); and rubber cultivation in the British Empire.

The International Rubber Exposition in London, September 14–26, 1908. S. Soskin (*Tropenflanzer Beihefte, 9 (1908), No. 6, pp. 285–336, pls. 3, chart*

1).—In addition to notes on the exhibits and sketches of the rubber industry in the several countries represented, consideration is given to the rubber industry as a whole relative to the total area planted to rubber and estimates of future production, the labor question and cost of planting operations, varieties, and methods and cost of harvesting and preparing rubber.

Reports of the superintendent of forests for 1904–1906, W. F. Fox (*N. Y. State Forest, Fish and Game Com. Ann. Rpts., 10–12 (1904–1906), pp. 35–112, pls. 7, fig. 1*).—These reports are similar in nature. The report for 1904 (E. S. R., 17, p. 871) and the report for 1906 (E. S. R., 19, p. 1147) have been noted as separates.

A statistical review of the forest administration of the Grand-Duchy of Baden for the year 1906 (*Statis. Nachr. Forstverw. Baden, 29 (1906), pp. XXI+135, dgms. 9*).—In addition to the statistical data for 1906 of forest areas, planting and cutting operations, yields, and revenue from various forest products comparative data are given for the period from 1878 to 1905.

Handbook for the Prussian forester, R. Radtke (*Handbuch für den Preussischen Förster. Neudamm, 1908, 4. ed., pp. XXXIV+999*).—This is a handbook of information relative to the state, communal, and private forest service of Prussia, the training and duties of foresters and forest guards, forest laws, regulations, etc.

Fire protection on the ticket-patrol system, D. N. Avasia (*Indian Forester, 34 (1908), No. 11, pp. 653–657, fig. 1*).—A brief description is given of the system of fire protection as carried out in the Allapilli teak forests in the Southern Circle of the Central Provinces, India.

DISEASES OF PLANTS.

Diseases and injuries to cultivated plants in 1905 (*Ber. Landw. Reichsamte Innern [Germany], No. 5, pp. VII+168*).—After reviewing the weather in relation to crop diseases and pests in Germany, a compilation is given of the diseases and insect injuries of cereals, root crops, forage plants, fiber plants, hops, tobacco, orchard fruits, grapes, vegetables, forest trees, etc. A tabular summary showing the distribution of the diseases, host plants, relative amount of injury, etc., concludes the report.

The potato black scab, T. Johnson (*Nature [London], 79 (1908), No. 2038, p. 67*).—The author reports that the abundant occurrence of the black scab of potatoes, due to *Chrysophlyctis endobiotica*, has enabled him to carry on some studies on the life history of the fungus. He has found that the so-called spores have proved to be zoosporangia and has studied the effects of temperature, nutrition, moisture, and light on their germination.

Soil sterilizing, Bordeaux mixture, and poisons for tobacco seed beds, W. T. Horne (*Estac. Cent. Agron. Cuba Circ. 30, pp. 11*).—Notes are given on hot-water sterilization of tobacco seed beds, the use of Bordeaux mixture for the control of the damping-off fungus, and poisonous baits for insects that affect tobacco plants in the seed bed.

Rust on wheat, J. M. Hayman (*Rpt. Cawnpore [India] Agr. Sta., 1907, pp. 54–57*).—For a number of years wheat has been grown in glass cages at the Cawnpore Station, the object of the investigation being to determine whether rust will appear on wheat grown under conditions which exclude the possibility of external infection. In all, 195 plants have been grown under protective conditions, and up to the end of the season of 1906 only negative results had been obtained. In 1907, however, a few pustules of rust were found occurring on the wheat plants in different glass cases. While there may have been some means for external infection, it is thought by the author to be

unlikely, as every precaution was taken to prevent the transmission of the disease in this way.

Studies were continued to determine the propagation of rust from season to season by volunteer wheat, but as yet no definite results have been obtained.

Experiments are in progress on the selection of rust-resistant varieties, in which a susceptible variety of wheat has been chosen and subjected to the conditions believed to favor the development of rust. While the past year was one favorable to rust, about 35 plants were secured that showed considerable resistance.

Peach leaf curl, yellows, rosette, and little peach, E. L. WORSHAM and W. V. REED (*Ga. Bd. Ent. Bul. 26, pp. 24, figs. 11*).—Descriptions are given of these diseases of the peach, with particular attention to the peach leaf curl.

From the results of a series of experiments for the control of the peach leaf curl, in which the trees were sprayed with Bordeaux mixture, copper-sulphate solution, lime-sulphur washes, Oregon wash, and soda Bordeaux, it appears that Bordeaux mixture, lime-sulphur wash, and Oregon wash, which is a modification of a lime-sulphur compound, were all effective in the control of the disease.

The other diseases are briefly described and, where known, suggestions given for their prevention.

Experiments for the control of Peronospora, H. SCHELLENBERG (*Landw. Jahrb. Schweiz, 22 (1908), No. 5, pp. 284–286*).—The results of experiments in spraying various fungicides on grapes for the control of downy mildew are given.

In one series of experiments the relative efficiency was tested of 0.5 and 1 per cent solutions of Bordeaux mixture and of different strengths of sulphur azurin and of Tenax, which is said to be a mixture of copper sulphate, aluminium sulphate, and soda. In these tests 4 and 5 applications of the fungicides were given at different periods during the season, and at the time of harvesting the average weight of grapes and the weight per vine were determined. In both instances the average weight of the individual grapes and the total production per vine were the highest where Bordeaux mixture had been used.

In a second series of experiments 2 per cent Bordeaux mixture, a sulphur-copper preparation, and 2 strengths of soda Bordeaux were compared. The best results were obtained with soda Bordeaux containing 2 kg. of copper sulphate and 0.9 kg. of soda to 100 liters of water.

The chestnut bark disease, E. A. STERLING (*Engin. News, 60 (1908), No. 13, pp. 332, 333*).—Attention is called to the disease popularly known as chestnut blight, which is due to the fungus *Diaporthe parasitica*. The commercial importance of the rapid spread of this disease is pointed out as threatening the existence of the chestnut tree as a factor in American forestry. The author states that the spread of the chestnut blight and the ultimate destruction of our chestnut forests will probably mean an annual loss to the United States of from $25,000,000 to $30,000,000.

The prompt removal and destruction of infected limbs and trees and the painting of wounds with tar paint will probably save individual specimens, but there appears to be little promise that the disease can be controlled in the extensive second-growth stands and merchantable timber throughout the range of the species.

The mildew of oaks, L. MANGIN (*Jour. Agr. Prat., n. ser., 16 (1908), No. 30, pp. 108–110, figs. 2*).—The mildew of oaks due to *Oïdium quercinum* is described. The author thinks that the fungus is the conidial phase of *Microsphæra alni*, and that while its attack could be prevented by the use of sulphur or some of the polysulphid sprays where only a few trees are to be treated, it will be found impracticable to attempt such means in forests or large plantations.

Epidemic of oak mildew, F. W. Neger (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 11, pp. 539–542*).—An account is given showing the widespread epidemic of mildew of oaks in Europe during the summer of 1908, and the relation of the conidial stage of the mildew to the perfect form is discussed. A note by K. von Tubeuf describes briefly the occurrence of the mildew in Bavaria.

Notes on some new diseases of Coniferæ, A. W. Borthwick (*Trans. and Proc. Bot. Soc. Edinb., 23 (1907), pt. 3, pp. 232, 233*).—The author describes a new disease of *Picea pungens*, due to a fungus which attacks the buds and produces large black, conical swellings in which the fruiting bodies of the fungus occur. The bud is either immediately destroyed, or it may produce a much twisted cankered shoot which frequently dies at an early period. The characteristics of the fungus are said to resemble those of the various Cucurbitaria.

The second disease described is one of *Abies pectinata*. In this case the fungus belongs apparently to the Ascomycetes and it affects the leaves of the current year's growth. At first they become light brown in color and finally dark brown. At the maturity of the fungus the fructifications appear as small black, spherical swellings on the infested leaves. This fungus has caused considerable damage to the species mentioned above.

As yet neither of the fungi has been definitely determined and they are to be the subject of further investigation.

Annual report of the literature on plant diseases, M. Hollrung et al. (*Jahresber. Pflanzenkrank., 9 (1906), pp. VIII+298*).—This report, published in 1908, reviews the literature which appeared in 1906 relating to plant diseases and insect pests, about 1,800 papers being noted by title or abstract. The general groupings of the literature are general plant pathology and pathological anatomy, special pathology, plant hygiene, and methods for plant protection. The detailed arrangement and method of treatment of topics are similar to those in previous reports (E. S. R., 18, p. 746).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The zoological record, D. Sharp (*Zool. Rec., 43 (1906), pp. 1348*).—This volume contains the usual classified bibliographies covering the literature relating to all branches of zoology published during 1906, and in addition entries for 1901–1905 which were received too late for inclusion in the previous volume (E. S. R., 18, p. 1058).

A study of the pocket gopher, J. C. Dare (*Orchard and Farm, 8 (1908), No. 5, p. 11, fig. 1*).—A brief account of the habits and economic importance of the pocket gopher.

Rats and their animal parasites, A. E. Shipley (*Jour. Econ. Biol., 3 (1908), No. 3, pp. 61–83*).—Following a discussion of the habits and economic importance of rats, a complete list is given of all parasites, both ectoparasites and endoparasites, of which rats are known to serve as hosts.

The leprosy-like disease among rats on the Pacific coast, W. B. Wherry (*Jour. Amer. Med. Assoc., 50 (1908), No. 23, p. 1903*).—Out of over 30,000 rats examined 2 were found to be ill of a leprosy-like disease due to acid-fast bacilli. Both specimens were large female rats (*Mus decumanus*). A note is appended stating that since the above report was written a male and female of the same species have also been found affected with the disease. From the male was taken a single flea (*Ceratophyllus fasciatus*). This flea was ground up on a slide and stained by the tubercle method, but contained no acid-proof bacilli.

Experiments on rat extermination. R. O. Saigol (*Indian Med. Gaz., 43 (1908), No. 7, pp. 254–257*).—"Although hope had been extended from many quarters that rat extermination would be practicable by employing some microorganism which would not only produce a disease in the animals directly experimented upon, but an infectious fatal disease among the rat population as a whole through these diseased rats being let loose, this has not been borne out by the experiments given."

The warblers of North America. F. M. Chapman (*New York, 1907, pp. IX+306, pls. 32*).—This book has been prepared by the author in cooperation with other ornithologists to meet the demand for a fully illustrated work which will serve as an aid to the field identification of warblers and to the study of their life histories.

Our American flycatchers. B. S. Bowdish (*Sci. Amer. Sup., 66 (1908), No. 1710, pp. 226, 227, figs. 7*).—The habits, peculiarities, and economic importance of these birds are briefly described; photographs taken in the natural state accompany the article.

The midsummer bird life of Illinois: A statistical study. S. A. Forbes (*Amer. Nat., 42 (1908), No. 500, pp. 505–519*).—In continuation of earlier work (E. S. R., 18, p. 1143), observations were made in southern, central, and northern Illinois, 2 observers marching at a distance of 30 yards apart, covering a distance of 428 miles. Records were made of the number of each species of birds observed and of their ecological distribution. The number of native birds, European sparrows excluded, was found to be 527 to the square mile. A total of 7,740 individuals was observed, among which were recognized 85 species. Of these, 85 per cent belonged to the 21 most common species. The relative occurrence of bird life in crops, based on these data, is shown by the following table:

Birds observed in crops in midsummer, 1907.

Kind of crop.	Number.	Per cent.	Number per square mile.	Comparative densities. (Acreage for entire State=1.)
Pastures	2,107	27.2	878	1.36
Meadows	1,814	23.4	920	1.43
Grain	1,667	21.5	562	.87
Corn	1,169	15.1	300	.47
Other crops	983	12.8	.....	.....

A native bird destroying the sparrow. C. T. Musson (*Agr. Gaz. N. S. Wales, 19 (1908), No. 8, p. 680*).—The ground cuckoo-shrike (*Pteropodocys phasianella*) has appeared in one locality and is killing the sparrows though not attacking other birds.

The value of birds as insect destroyers. Mrs. W. F. Parrott (*Proc. Iowa Park and Forestry Assoc., 7 (1907), pp. 47–55*).—A brief account is given of birds as insect destroyers showing the importance of their protection.

Locusts birds. J. W. Gunning (*Transvaal Agr. Jour., 6 (1908), No. 24, pp. 527–530*).—A brief account is given of birds which feed upon locusts and are protected by law during certain seasons of the year.

Bufo fowleri in northern Georgia. H. A. Allard (*Science, n. ser., 28 (1908), No. 723, pp. 655, 656*).—Notes on the habits of Fowler's toad, which is shown to occur abundantly in much of the territory east of the Appalachian Mountains.

Report of scientific work in the field of entomology during 1906, G. SEIDLITZ (*Arch. Naturgesch., 73 (1907), II, No. 2, 1. half, pp. 448*).—A bibliography is presented of the literature on general entomology and the coleoptera published during the year 1906.

The new ideas on the origin of species by mutation, L. CUÉNOT (*Rev. Gén. Sci., 19 (1908), No. 21, pp. 860–871, figs. 8*).—The author discusses this subject at some length. A brief bibliography is given.

Notes on the value of introduced parasites or beneficial insects, W. W. FROGGATT (*West Indian Bul., 9 (1908), No. 3, pp. 262–264*).—A paper read at the meeting of the West Indian agricultural conference in which a brief account is given of an investigation of the value of parasitic insects in Hawaii and California.

Report of the entomologist, C. W. HOWARD (*Transvaal Dept. Agr. Ann. Rpt. 1906–7, pp. 193–217, maps 4*).—The greatest duty for the past 2 years has been that of combating the locusts, other work being considered secondary in view of the need of solving this question so that the farmers would have confidence in entering upon the work. A detailed account is given of the campaign against the brown and red locusts, together with maps showing the flights and areas infested by each species during 1906 and 1907.

Miscellaneous notes are included on the enemies of fruit trees and garden crops, and of insect parasites of man and domesticated animals.

Notes from Angola, F. C. WELLMAN (*Jour. Trop. Med. and Hyg. [London], 11 (1908) No. 8, pp. 117, 118, figs. 4*).—These notes are a continuation of a series which appeared in 1906. *Sarcopsylla penetrans* is mentioned as a factor in the ainhum disease. A list of 21 species of Tabanids is given. The effects of the sting of the common Angolan scorpion (*Uroplectes occidentalis*) and some other venomous arthropods are described.

Report of the State nursery inspector, A. E. STENE (*Ann. Rpt. Bd. Agr. R. I., 23 (1907), pp. 21–44, pls. 12, fig. 1*).—Among the injurious insects of the year here reported are the army worm, codling moth, apple maggot, frosted lightning hopper (*Ormenis pruinosa*), maple phenacoccus (*Phenacoccus acericola*), spruce gall louse (*Chermes abietes*), and rose scale (*Aulacaspis rosæ*). Various plant diseases are also reported.

Report of the superintendent for the suppression of the gipsy and brown-tail moths, for the year 1907, A. E. STENE (*Ann. Rpt. Bd. Agr. R. I., 23 (1907), App., pp. 1–52, pls. 9, figs. 2, map 1*).—A general account of these two pests and the work of suppression carried on in Rhode Island.

Notes on the work against the gipsy moth, E. P. FELT (*Jour. Econ. Ent., 1 (1908), No. 4, pp. 275, 276*).—This is a brief account of an examination made of the work being carried on in New England against the gipsy moth. Attention is called to a 10-horsepower gasoline engine manufactured for automobiles that is being used in place of a 6-horsepower engine weighing 1,800 lbs. formerly in use. A heavy 1½-in. hose from 400 to 800 ft. long with a smooth ¾-in. nozzle is used for work in woodlands, a pressure of 200 to 250 lbs. being maintained.

The machinery, which is mounted upon a stout wagon with a 400-gal. tank, is drawn by 4 horses. It is said to be capable of spraying 14 to 16 acres a day at a cost of about $10.20 per acre where the woodland is fairly clear of brush.

Description of new devices for rearing insects, A. F. BURGESS (*Jour. Econ. Ent., 1 (1908), No. 4, pp. 267–269, pls. 2*).—Several devices used at the Gipsy Moth Parasite Laboratory in Massachusetts are here described and illustrated.

Field tables of lepidoptera, W. T. M. FORBES (*Worcester, Mass., 1906, pp. 141*).—Tables based mainly upon color markings are here given for the adults

and for the larvæ. Data are also included on the food plants and dates of appearance.

Notes on the early stages of some Pamphila, P. LAURENT (*Ent. News, 19 (1908), No. 9, pp. 408–417*).—Notes are given on the life history of 17 species of butterflies belonging to the genus Pamphila. The larvæ seem to feed more readily on the coarser species of grasses.

Katra (hairy caterpillars) in Gujaret, C. U. PATEL (*Agr. Jour. India, 3 (1908), No. 2, pp. 152–160, dgm. 1*).—The species *Amsacta moorei, A. lactinea,* and *A. lineola* appear after the first fall of monsoon rain and attack and do great damage to newly grown crops, especially to millet. A general account is given of the life history, parasites, and enemies of this pest. Remedial experiments are reported.

On the Proctotrypid genus Antæon, with descriptions of the new species and a table of those occurring in Britain, A. J. CHITTY (*Ent. Mo. Mag., 2. ser., 19 (1908), Nos. 222, pp. 141–144; 223, pp. 145, 146; 225, pp. 209–215*).

Upon the aphis-feeding species of Aphelinus, L. O. HOWARD (*Ent. News, 19 (1908), No. 8, pp. 365–367*).—Four species of the genus Aphelinus are recorded as parasitic upon aphids, of which *Aphelinus semiflavus* and *A. nigritus* are here described as new. A table is given for the separation of these species.

Notes on the Coccinellidæ, T. L. CASEY (*Canad. Ent., 40 (1908), No. 11, pp. 393–421*).—Notes on the ladybirds with descriptions of one genus and several species and subspecies new to science.

On a collection of Coccidæ and other insects affecting some cultivated and wild plants in Java and in tropical western Africa, R. NEWSTEAD (*Jour. Econ. Biol., 3 (1908), No. 2, pp. 33–42, pls. 2*).—In addition to miscellaneous notes a genus, 6 species, and 2 varieties are described as new to science.

The present state of our knowledge of the Odonata of Mexico and Central America, P. P. CALVERT (*Science, n. ser., 28 (1908), No. 724, pp. 692–695*).—The author here presents a summary of the main results obtained from studies on the Odonata and a comparison with previous work done in this field.

An army worm in the Transvaal, F. THOMSEN (*Transvaal Agr. Jour., 6 (1908), No. 24, pp. 585–589*).—Army worms which may be *Caradrina exigua* or *C. orbicularis,* or both, are described as destroying the crop in one locality. A description is given of the stages, and also notes on the life history, habits, and food plants. Remedies are discussed.

The seventeen-year cicada on Staten Island in 1907, W. T. DAVIS (*Proc. Staten Isl. Assoc. Arts and Sci., 2 (1907–8), No. 1, pp. 1, 2*).—It is concluded that the individuals were sufficiently numerous to insure the insects' appearance in 1924.

A new predaceous enemy of the cotton boll weevil, W. NEWELL and R. C. TREHERNE (*Jour. Econ. Ent., 1 (1908), No. 4, p. 244*).—The carabid beetle, *Evarthrus sodalis,* and a second undetermined species of the same genus, are here reported as having been found to destroy *Anthonomus grandis.*

The first and last essential step in combating the boll weevil, W. E. HINDS (*Jour. Econ. Ent., 1 (1908), No. 4, pp. 233–243*).—This is a paper read at the meeting of the Association of Economic Entomologists, held in Chicago, in December, 1907. The author briefly reviews the results obtained in the investigation of the boll weevil, attention being called to both direct and indirect methods of combat. Particular attention is given to investigations conducted by W. W. Yothers and the author upon hibernation, a more detailed account of which is to be issued in bulletin form by the Bureau of Entomology of this Department. The following general conclusion is drawn:

"The destruction of stalks by some effective method and as long as may be possible before the normal time for weevils to enter hibernation constitutes

the most effective method now known of reducing the severity of the weevil attack upon the following crop and that it therefore deserves general recognition and adoption as the last step in the treatment of each season's crop and essentially the first step also in the production of a crop with the minimum weevil injury during the following season."

Notes on Transvaal tobacco pests, C. W. HOWARD (*Transvaal Agr. Jour., 6 (1908), No. 24, pp. 609–616, pls. 2, figs. 4*).—The only pests that the author considers at all serious are the cutworm, splitworm, and nematode. Notes are given upon the life history and habits of the splitworm (*Phthorimæa operculella*) gall worm (*Heterodera radicicola*), cutworm, bud worm (*Heliothis armiger*), pigweed caterpillar (*Caradrina exigua*), hornworms, aphis or green fly, green bug (*Nezara viridula*), and curculio beetles (*Peritelus ornatus* and *Strophosomus* sp.). Remedies are considered and directions are given for their application.

Insect pests of the mangel-wurzel, H. M. LEFROY (*Agr. Jour. India, 3 (1908), No. 2, pp. 161–163*).—The mangel-wurzel, while not one of the ordinary crop plants under cultivation in India, has been recommended as worthy to be made such. The insects which especially attack the plant are the surface weevil (*Tanymecus indicus*), which is followed by the surface caterpillar and later by the indigo caterpillar.

The earth flea, a common pest of winter vegetables, R. W. JACK (*Agr. Jour. Cape Good Hope, 32 (1908), No. 5, pp. 615–620, figs. 4*).—An account is given of a species of mite belonging to the family Enpodidæ which attacks nearly all commonly cultivated vegetables. It is stated that the injury can be largely prevented by clean cultivation and that the pest can be economically destroyed by spraying with the tobacco wash.

Grain weevils (*Bd. Agr. and Fisheries* [*London*], *Leaflet 206, pp. 4, fig. 1*).—An account is given of *Calandra granaria* and *C. oryzæ*, with remedial measures.

The diseases and enemies of useful and ornamental horticultural plants, F. KRÜGER and G. RÖRIG (*Krankheiten und Beschädigungen der Nutz und Zierpflanzen des Gartenbaues. Stuttgart, 1908, pp. VIII+212, pls. 4, figs. 224*).—In this book the author discusses the insect and other animal enemies as well as the plant diseases. Remedies are considered and indexes, of both plants and enemies, are given.

Experiments with remedies for insect enemies of fruit trees, TRUELLE (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 7, pp. 507–513*).—A report is given of experiments with remedies for pests of fruit trees, particularly for *Hyponomeuta mainella*.

Massachusetts fruit trees and their insect foes, H. T. FERNALD (*Agr. of Mass., 1907, pp. 111–138, figs. 16*).—An address delivered before the meeting of the State board of agriculture in which the insect enemies of fruit trees of the State are discussed.

Gosford-Narara fruit fly and codling moth control experiment, W. B. GURNEY (*Agr. Gaz. N. S. Wales, 19 (1908), No. 7, pp. 581–584*).—The life history of *Ceratitis capitata*, the regulations in effect in November, 1907, with the penalty clause concerning care of fruit orchards, in connection with the codling moth and fruit fly, and an account of experiments to demonstrate to growers the practical value of carrying out the provisions of fruit fly regulations, are given.

The orchards were found badly infested with 3 species of fruit fly, the Mediterranean fly (*Ceratitis capitata*), the Queensland fly (*Dacus* (*Tephritis*) *tryoni*), and the Island fly (*Trypeta psidii*), the species first named being the more numerous. The 2 latter species have been bred from native plum or black apple (*Sideroxylon australe*), berries of white ash (*Schizoneria ovata*),

and wild black fig (*Ficus stephanocarpa*). It is thought, however, that reinfection from the wild fruit does not to any great extent annul the value of work done in orchards to check the fly.

Paraffin remedy v. poisoned bait [for the fruit fly], C. W. Mally (*Agr. Jour. Cape Good Hope, 32 (1908), No. 5, pp. 609–614*).—In experiments conducted it was found that *Ceratitis capitata* was not attracted to paraffin oil in comparison with pineapple juice and treacle (molasses). Bees were attracted to honey when sprayed on a hedge near a hive, but paid no attention to other sweets. This fact is of importance in connection with the application of poisoned bait for the fruit fly.

In a supplementary note, the government entomologist (C. P. Lounsbury) briefly reports additional experiments. He considers that the experiments here reported show that spraying the trees with poisoned baits, as previously recommended, affords greater protection against the pest than the exposure of vessels of paraffin oil.

Notes on a chalcid (Syntomaspis druparum) infesting apple seeds, C. R. Crosby (*Ann. Ent. Soc. Amer., 1 (1908), No. 1, p. 38*).—This species, previously known to infest the seeds of the wild apple in Crimea, has been found generally distributed in New York State where it infests the cultivated varieties as well as the wild apple (*Malus coronaria*).

The Smyrna fig and its pollinating insect, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 32 (1908), No. 5, pp. 561–568, fig. 1*).—An account is given of the rôle of *Blastophaga grossorum* in the fertilization of the flowers of the Smyrna fig. It is stated that the insect has been recently introduced into South Africa.

Report of the investigations of the olive fly in France in 1907, Chapelle (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 8, pp. 979–990*).—A description of *Dacus oleæ*, its life history, habits, and the nature of its injury is followed by an account of the work in combating it. The author concludes from researches in Italy and those here reported that the efficiency of the application of sweetened arsenicals is clearly demonstrated. The formulæ of insecticides used are given. Analyses of the oil from olives treated with these insecticides showed the presence of only traces of arsenic.

The fight against the olive fly, J. Chapelle (*Bul. Mens. Soc. Cent. Agr., Hort. et Acclim. Nice, 48 (1908), No. 8, pp. 239–247*).—A more extensive report of these experiments is noted above.

The pear-tree cephid, P. Passy (*Rev. Hort. [Paris], 80 (1908), No. 20, pp. 474–477, figs. 6*).—Pear trees are reported to be injured to a considerable extent and apple trees less so by *Cephus compressus* which, as a larva bores in the young twigs. The ichneumon, *Pimpla instigator*, plays an active rôle in the repression of the pest.

Isolation of orange groves and fumigation for the white fly, A. W. Morrill (*Fla. Fruit and Produce News, 1 (1908), No. 8, pp. 3, 7*).—A brief summary of results from fumigation experiments with hydrocyanic-acid gas which had been obtained since the preparation of Bulletin 76 of the Bureau of Entomology of this Department already noted (E. S. R., 20, p. 555). These show a wider applicability for the white fly than at first supposed. An isolation of 200 or 300 ft. will ordinarily insure immunity from the occurrence of the fly in injurious abundance for at least one season. The owner of a grove of 10 acres or more need not be deterred from fumigating on account of an infested grove of any size adjoining on one side. There are comparatively few groves that need be considered impracticable to fumigate on account of their location.

Observations upon the parasitism of an aphid that attacks citrus fruits, U. Pierantoni (*Atti R. Ist. Incoragg. Napoli, 6. ser., 59 (1907), pp. 1–7, pl. 1*).—

Aphidius aurantii, a brachonid attacking *Toxoptera aurantii*, is described as new to science. Observations upon the habits of the aphid and its parasite are accompanied by figures of both.

Cacao beetles and the use and application of lime, R. D. ANSTEAD (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 9, pp. 387–392*).—The cacao beetle (*Steirastoma depressum*) as a larva does great injury to the cacao trees, boring between the bark and the wood. Methods of preventing the injury are discussed.

Notes on Termes gestroi and other species of termites found on rubber estates in the Federated Malay States, H. E. PRATT (*Agr. Bul. Straits and Fed. Malay States, 6 (1908), No. 5, pp. 157–169*).—An account is given of injury by *Termes gestroi* to cultivated Para (*Hevea brasiliensis*) and Rambong (*Ficus elastica*) rubber trees. In order to distinguish this from other species a table is given for the separation of the common species met with on rubber plantations with descriptions of their various castes. Because of the damage to rubber trees of all ages and the difficulty in destroying it this white ant is considered to be the planter's most serious enemy. Methods to be employed in combating it are discussed.

The brown scale of the gooseberry and currant, R. NEWSTEAD (*Jour. Bd. Agr. [London], 15 (1908), No. 3, pp. 195–199, figs. 5*).—The scale *Lecanium persicæ ribis*, is said to be generally distributed throughout England but is less known in Wales, Scotland, and Ireland. An account of its life history is given and also the formulas and directions for applying the caustic-soda and paraffin-soda washes.

On an enchytraeid worm injurious to the seedlings of the larch, C. G. HEWITT (*Jour. Econ. Biol., 3 (1908), No. 2, pp. 43–45, pl. 1*).—A small white worm which was identified as *Fridericia bisetosa* is described as frequently attacking larch seedlings. Its presence is readily discernible by the dead and withered appearance of the plants. Injections of carbon bisulphid into the soil at a distance of 6 or 8 in. on each side of the row in doses of 0.25 to 0.50 oz. are recommended.

A new cecidomyiid on oak, H. M. RUSSELL and C. W. HOOKER (*Ent. News, 19 (1908), No. 8, pp. 349–352, pl. 1*).—A new species of gall fly which works on the leaves of the black oak is described as *Cecidomyia foliora*. Its life history and a description of the immature stages are given.

The life history of Syagrius intrudens, a destructive fern-eating weevil, J. MANGAN (*Jour. Econ. Biol., 3 (1908), No. 3, pp. 84–91, pls. 2*).—This weevil is reported as a persistent and exceedingly destructive pest of ferns at the Royal Botanical Gardens at Dublin. The larvæ burrow through the larger portions of the stems and even in the hardest parts of the rhizome. The ravages appear to be strictly confined to hothouse ferns. The most successful method of dealing with the pest is said to be that of soaking the roots in water. After a period of 15 minutes' immersion, all the weevils in the soil will have taken refuge in the stems, where they can be picked off by hand and destroyed.

A new species of tick from the Transvaal, L. G. NEUMANN (*Ann. Transvaal Mus., 1 (1908), No. 2, pp. 170–172*).—The author here describes *Rhipicentor ricinus*, a tick taken from *Erinaceus frontalis* at Pretoria, as a new species.

The structure, development, and bionomics of the house fly, II, C. G. HEWITT (*Quart. Jour. Micros. Sci. [London], n. ser., 52 (1908), No. 208, pp. 495–545, pls. 4*).—A second paper on the subject (E. S. R., 19, p. 664).

Temperature, character of food, moisture, and fermentation are shown to be the important factors in the development of the fly. Under favorable conditions, eggs may hatch as soon as 8 hours after deposition, while if kept at a temperature as low as 10° C., 2 or 3 days may elapse before the larvæ

emerge. The larval stage consisting of three instars may be passed in 5 days. The process of pupation may be completed in 6 hours and the pupal stage passed in 3 or 4 days, although it is usually 4 or 5 days.

The shortest period in which development took place was 8 days, when larvæ were incubated at a constant temperature of 35° C. Flies become sexually mature in 10 or 14 days after emergence and commence oviposition as soon as 4 days later. A bibliographical list is given.

Observations on the bionomics of fleas with special reference to Pulex cheopis (*Jour. Hyg. [Cambridge]*, *8 (1908)*, *No. 2, pp. 236–259*).—The life history, habits, dispersal, and collection and examination of fleas are here considered. Longevity and other experiments are reported.

The part played by insects in the epidemiology of plague, D. T. Verjbitski (*Jour. Hyg. [Cambridge]*, *8 (1908)*, *No. 2, pp. 162–208*).—Experiments were made by the author at Cronstadt and St. Petersburg with fleas and bugs with a view of determining the connection between human plague epidemics and plague epidemics among rats. Infected fleas were found to communicate plague to healthy animals for 3 days and bugs (*Cimex lectularius*) for 5 days after infection. The rat flea of Russia (*Typhlopsylla musculi*) does not bite man, but the fleas infesting man do bite rats and the fleas found on dogs and cats bite both human beings and rats. Fleas infesting man and fleas found on cats and dogs can live on rats as casual parasites and therefore can, under certain conditions, play a part in the transmission of plague from rats to human beings and vice versa.

Insect transmission of bubonic plague: A study of the San Francisco epidemic, M. B. Mitzmain (*Eut. News*, *19 (1908)*, *No. 8, pp. 353–359*).—An account is given of the fleas obtained in the examination of 1,800 rats. These examinations were made in an attempt to locate the source of the rat and flea introduction into the infected regions of California.

Preservation of the plague bacillus in the body of the bedbug, V. Jordansky and N. Kladnitsky (*Ann. Inst. Pasteur*, *22 (1908)*, *No. 5, pp. 455–462*).—The work of other investigators is briefly reviewed, and experiments with rats are reported. The authors find that the plague bacillus is preserved in virulent form in bedbugs for 10 days or longer, and conclude that in certain cases at least this insect may be an active agent in the transmission of the disease.

Report on the anatomy of the tsetse fly (Glossina palpalis), E. A. Minchin (*Rpts. Sleeping Sickness Com. Roy. Soc., 1907, No. 8, pp. 106–122, figs. 6*).—A description accompanied by drawings of the general anatomy of *Glossina palpalis* especially of its digestive tract. This is of importance in the study of the evolution of trypanosomes within the body of their arthropod hosts.

The reproduction and variations in the development of Glossina palpalis, E. Roubaud (*Compt. Rend. Acad. Sci. [Paris]*, *146 (1908)*, *No. 7, pp. 362–365; abs. in Bul. Inst. Pasteur*, *6 (1908)*, *No. 10, p. 480*).—The author has made life history studies of *G. palpalis*, the results of which are here reported.

Glossina palpalis in its relation to Trypanosoma gambiense and other trypanosomes, E. A. Minchin, A. C. H. Gray and F. M. G. Tulloch (*Rpts. Sleeping Sickness Com. Roy. Soc., 1907, No. 8, pp. 122–136, pls. 2, figs. 11, map 1*).—Experiments made to determine the exact mode of infection, particularly as to whether the fly becomes infectious at any definite period after having been fed on an infected animal, gave negative results, although positive proof was obtained that *G. palpalis* can convey trypanosomes by means of its proboscis from an infected to a healthy animal if it goes straight from one to the other. Infection was thus transmitted in 4 out of 5 experiments when *G. palpalis* was used as the transmitting agent and once out of 4 experiments when a Stomoxys was used. It is shown that the infection is conveyed by the con-

tamination of the proboscis and that if the fly be allowed to clean its proboscis by piercing the skin of one animal, it is no longer infectious to a second.

Experiments seem to show that the number of fly-bites required to produce infection is a very variable one, more than 1,000 flies having fed on a susceptible animal without infecting it. The smallest number of *G. palpalis* with which sleeping sickness was produced by the authors was 134.

"At 48 hours after feeding, the trypanosomes (*T. gambiense*) are still numerous in the intestine of the fly, and a type of more indifferent character begins to make its appearance. At 72 hours the trypanosomes are usually beginning to become more scanty and difficult to find in the digestive tract of the fly, although in some cases they are still numerous and chiefly of the indifferent type. At 96 hours, in almost every case, not a single trypanosome could be found even after the most careful searching." So far as conclusions could be drawn from the observation it appears that *T. gambiense* becomes extinct in the tsetse fly after the third day.

Two species of trypanosomes (*T. grayi* and *T. tullochii*) were found in freshly caught tsetse flies, the former in 1.47 per cent and the latter in 0.17 per cent of 3,000 flies examined. These 2 species were found to have nothing to do with sleeping sickness and are not developmental stages of *T. gambiense*.

Report on experiments to ascertain the ability of tsetse flies to convey Trypanosoma gambiense, P. H. Ross (*Rpts. Sleeping Sickness Com. Roy. Soc., 1907, No. 8, pp. 80–85*).—From experiments conducted with *Glossina fusca* and *G. pallidipes*, the author concludes that the former does not convey any species of trypanosoma, but that the latter evidently can. Having the work of Schaudinn in mind, the author searched but did not find an intracorpuscular stage of trypanosoma. *G. pallidipes* is said to attack as soon as one gets among them, while *G. fusca* shows no inclination to bite men. *G. longipennis* does not appear to bite during the day, but after 4 p. m. one is immediately bitten upon approach.

Descriptions and records of bees, T. D. A. Cockerell (*Ann. and Mag. Nat. Hist., 8. ser., 1 (1908), Nos. 3, pp. 259–267; 4, pp. 337–344*).—In the first article, in addition to descriptions of exotic species, 1 genus and 3 species from this country are described as new. In the second article 11 species from this country belonging to the genus Megachile are described as new.

Winter ventilation of hives, C. P. Dadant (*Amer. Bee Jour., 48 (1908), No. 11, pp. 333, 334*).—The author finds moisture absorbents over the cluster to be better than upper ventilation and that a slight amount of upper ventilation is better than a tight ceiling impervious to moisture. Entrance ventilation in a moderate degree is considered necessary.

[A digest and discussion of papers on bee keeping] (*Texas Dept. Agr. Bul. 3, pp. 119–135*).—A report and discussion of papers presented at the annual meeting of the Texas Bee Keepers' Association in which a number of subjects relating to apiculture, including varieties of bees, forms of hives, location and management of colonies, storing and marketing of honey, effect of pure food law, prices, etc., are presented and discussed.

Report of the State inspector of apiaries, M. E. Darby (*Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 59–66, figs. 2*).—Out of 215 apiaries and 3,028 colonies inspected during 1907, 82 apiaries and 297 colonies were found infected with foul brood.

The Argentine ant, a possible pest of the apiary, R. Benton (*Gleanings Bee Cult., 36 (1908), No. 23, pp. 1432–1434*).—The author records observations on the Argentine ant made in the vicinity of a colony of bees in California. He believes that the ants become sufficiently troublesome to interfere seriously with the field work of the bees and so prove themselves the cause of almost

inestimable loss. In correspondence, it has been learned that Newell has found at Baton Rouge, Louisiana, that the ants vigorously attack the larvæ in the hives and also carry away stored honey. These colonies have, however, been protected by the use of a stand having four legs, each resting in a dish of water. Mention is made of an ant which the author has observed in Montana to attack and cut up live bees at the hive entrance.

The silk industry. E. L. Peñafiel (*Prácticas de Industria Sedera. Madrid: Govt., 1907. pp. 103, figs. 38*).—In this guide details are given of the raising of silkworms and of silk production.

FOODS—HUMAN NUTRITION.

Constituents of the urine and blood and the bearing of the metabolism of Bengalis on the problems of nutrition. D. McCay (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1908, No. 34, pp. 67*).—This comprehensive investigation was undertaken particularly to study the relation of the native diet, low in nitrogen and high in nonnitrogenous constituents, to physical condition, body development, health and efficiency in comparison with the diet of Anglo-Indians and Eurasians in India.

As a part of the investigation, analyses were made on four or five consecutive days of the urine of 28 native students and assistants of the higher castes and of 16 natives of other castes, all of these being adult Hindus upon their ordinary diet. Observations were also made upon the blood of 170 Bengalis, two-thirds of them students and the remainder of different classes, but all apparently in good health and typical of the groups selected. The urine data showed that the average quantity of total nitrogen, urea, uric acid, and sulphates was lower than with Europeans according to the comparison made. Differences were also noted in the blood. As regards the observed low blood pressure of Bengalis in comparison with Europeans, the author believes that it must affect their vigor and energy. The observed differences in the chemical composition of the blood are ascribed to the use of a diet low in nitrogen, which prevents the nitrogenous tissues from drawing their nutritive material from so rich a source or from obtaining so free a supply of oxygen.

In the discussion of the daily metabolism of nitrogen it is pointed out that the value of 0.115 to 0.111 gm. per kilogram of body weight, which was noted in these studies, is essentially the quantity which is sometimes advocated as sufficient. Since this quantity represents the amount supplied by the usual diet of these native Indians, it confirms the conclusion that the body may be maintained in nitrogen equilibrium for a long time on a diet furnishing about one-third of that supplied by the commonly accepted dietary standards. From data summarized as to the body weight, height, and chest circumference of about 2,500 Bengali students, however, the author concludes that the Bengalis "do not reach the same standard of general physique as is attained by races of European origin; and yet from the evidence we can find no cause inherent in the Bengali as a race for this deficiency; on the contrary, we consider that there may be a very close relationship between the lower physical development of this people and the meager proteid constituent of the diet on which they subsist."

Studies are reported in detail of the nitrogen balance of 2 students living for 4 days on a diet consisting largely of rice and legumes. With the total computed intake 34.84 and 42.24 gm. nitrogen, respectively, there were gains of 0.80 and 0.51 gm. The nitrogen of the feces was very large, constituting from 23.86 to 25.42 per cent of that ingested. A similar set of investigations followed on 4 healthy prisoners for 35 days at hard labor on a diet in which

practically all the nitrogen was derived from rice and dhall (legumes). From 24.67 to 26.72 per cent of the nitrogen was excreted in the feces, but the nitrogen absorbed, averaging 0.185 gm. per kilogram daily, is believed to have been sufficient to meet all nitrogenous requirements. This large waste in the alimentary canal is deemed by the author exceedingly objectionable, not only from its economic aspects, but also in that it tends to permit excessive bacterial growth and the formation of toxic compounds, and he believes that it must be a factor in the prevalence of intestinal disorders and the causation of dysentery and kindred diseases.

From records extending over long periods the character and nutritive value of the diet of Bengali and Anglo-Indian and Eurasian students in Indian colleges are reported. The native diet in accordance with the usual food habits contained large proportions of carbohydrate foods, and little animal food, while that of the Anglo-Indian and Eurasian students was liberal as regards animal foods and other food constituents. Data of this character are summarized in the following table:

Nutrients in dietary of students in colleges in India.

[Quantity per man per day.]

Group studied.	Number of persons.	Protein.	Fat.	Carbohydrates.
		Gm.	*Gm.*	*Gm.*
Bengali students	568	67.1	71.6	548.7
Bengali students (more deficient dietary)	.....	43.6	33.9	200.3
Anglo-Indian and Eurasian students	.....	87.6	54.7	376.5
Do	126	94.97	56.2	467.0

Tabulated records extending over a large number of years were also available to the author as to the physical measurements of the 568 Bengali students included in the above table whose dietary provided a protein intake of 67.1 gm. per day of which 50.8 gm. was estimated to be digestible.

Although these students entered college at an average age of 17 or 18 years, the average increase in body weight from the first to the third year of their stay was but 2 lbs., only 15.3 per cent gaining continuously and 42.8 per cent showing a diminution. The chest girth also remained practically stationary, while the height increased from 1½ to 2½ in. It is concluded that "the metabolism of 0.148 gm. nitrogen per kilogram of body weight is not sufficient to meet the nitrogenous needs of the growing Bengali, and in from 30 to 40 per cent of the 568 examined was insufficient to prevent the loss of formed tissue proteid as the loss in body weight would appear to mean." Similar data for 126 Anglo-Indian and Eurasian students in the same college showed that on the diet furnished them, which supplied 0.203 gm. nitrogen per kilogram the students gained 14 lbs. in the first 3 years, only 2 per cent showing a diminution in weight. "The two classes enter college at about the same age, live in the same climate and under very similar conditions . . . but the results at the end of their college career are very different. The Anglo-Indian and Eurasian boys develop into strong, healthy men quite up to the average of European standards, while the Bengali students almost remain stationary as regards development."

Interesting statistics are given and comparisons made regarding the physical endurance of Bengali and European laborers, which, according to the author, show the decided superiority of the Europeans.

In discussing the effect of native diet on health, it is pointed out that the lowest insurance rate for native Indians is 33 per cent higher than that for Europeans in Europe and that there are many restrictions. Records of medical cases treated in the Medical College Hospital in Calcutta showed that the proportion of natives treated for kidney diseases was a little over twice that of Europeans. According to the author, it is surprising to find so great a prevalence of renal disease "in a country where scarlet fever is unknown," and in his opinion the observed facts do not indicate that "with a low proteid diet kidney function is less likely to become impaired. So far as the evidence goes, it would tend to show that, even with the exceedingly low nitrogenous intake of the population of Bengal, kidney disease is more common among natives than among Europeans."

Susceptibility to diabetes is also discussed. "Diabetes mellitus in Europeans is not accompanied in any very high percentage of cases by organic changes in the kidney—at least not in the earlier stages of the disease; whereas in the Bengali, albuminuria, even at the beginning of dietetic glycosuria, is fairly common. We are greatly inclined to think that the explanation of these differences rests largely with the nutritive power of the plasma in the two classes of people; the poor nitrogen content of the plasma in the Bengali starving the renal cells and causing them to lose their physiological property of preventing a filtration of the serum albumin of the blood into the tubules. . . . It would, therefore, appear that the large carbohydrate intake rendered necessary by a diet poor in nitrogen, and of course much more so the great quantities of sugar consumed by the Bengali, is even more likely to lead to injury and damage to the delicate tissues of glandular and other organs and to a diminution in the resisting power of the system than any excessive nitrogenous intake."

Parsimony in nutrition. J. CRICHTON-BROWNE (*Jour. Roy. Inst. Pub. Health, 16 (1908), Nos. 8, pp. 471–487; 9, pp. 527–552*).—A critical discussion of low proteid diet which the author does not regard as generally desirable.

Fads and feeding, C. S. READ (*London, 1908, pp. 163; rev. in Brit. Med. Jour., 1908, No. 2501, p. 1684*).—A popular discussion of different systems of diet.

Retail prices of food, 1890 to 1907 (*Bur. of Labor [U. S.] Bul. 77, pp. 181–332*).—A compilation of data regarding retail prices of food which on an average, it is stated, were higher in 1907 than in any other year of the 18-year period included, being 4.2 per cent higher than in 1906.

Cost of living of the working classes in the principal industrial towns of Great Britain (*Bur. of Labor [U. S.] Bul. 77, pp. 336–353*).—The data here reported were presented to Parliament in December, 1907, by the Labor Department of the British Board of Trade and represent the result of a comparative study of rents, prices paid for foods and other commodities and for fuel, and the standard rates of wages in certain selected localities.

Studies of the dinners served in Berlin restaurants, K. KIFSKALT (*Arch. Hyg., 66 (1908), No. 3, pp. 244–272*).—Detailed statistics are given of the kind and quantity of food served for dinners in a number of moderate-priced restaurants in Berlin and the nutritive value of the food. The results are discussed in comparison with those of earlier investigators and the author concludes that the nutritive value of such meals, owing to the higher cost of the portions served, is not greater than in 1895 when they were considered to furnish too little protein.

Food in Asiatic Turkey (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3297, pp. 8–10*).—Data supplied by E. L. Harris on diet and habits of the native population in Asia Minor and by T. R. Wallace on food and diet in Palestine are summarized.

The feeding of school children (*Pub. Health [London], 22 (1908), No. 3, pp. 97, 98*).—A review of a report by Hope published by the Liverpool Corporation on the subject of the insufficient or improper feeding of school children. A large amount of data is presented regarding existing conditions, the providing of meals for poor school children, and also regarding general food conditions.

"It will be seen that improper and injudicious feeding is exceedingly common, and by no means restricted to the poorer classes."

The feeding of the soldier (*Med. Rec. [N. Y.], 74 (1908), No. 15, p. 622*).—A discussion of recent information regarding the feeding of soldiers which led to the conclusion that a varied diet is best for the soldier as for the majority of individuals and "that a soldier on active duty benefits by a goodly proportion of meat in his rations."

Diets in tuberculosis, N. D. Bardsman and J. E. Chapman, *New York, 1908, pp. 184; rev. in Jour. Amer. Med. Assoc., 51 (1908), No. 13, pp. 1098, 1099*).—From their own observations and experience and the summary of results obtained by coworkers in Europe and America the authors have deduced some general principles regarding the diet of consumptives and the comparative value of different foodstuffs for the purpose.

Notes on scurvy in South Africa, D. M. Macrae (*Lancet [London], 1908, I, No. 26, pp. 1838–1840*).—In this discussion of a scurvy outbreak in South Africa, which the author attributes to the fact that the Kafirs, after having received the more generous rations supplied by the Government, were forced to subsist on a rather low diet largely of corn and with little meat, he states that marked success in treating scurvy has attended the use of a diet relatively rich in meat and that in cases where the recovery has been attributed to other food material it must be remembered that fresh meat has formed an important part of the ration. "It seems beyond doubt, however, that the elements necessary to maintain the equilibrium of bodily health belong to both fresh vegetables and animal food. Yet the facts of clinical experience have convinced the writer that the recent tendency to ascribe even the preponderance of merit in the treatment of scurvy to the use of fresh meat is not without considerable justification. In fresh raw meat or raw meat juice the physician possesses a remedy which he may use even in severe cases of scurvy."

How to cure spleens for food, E. T. Williams (*Amer. Med., n. ser., 2 (1907), No. 9, pp. 522, 523*).—Continuing work previously noted (E. S. R., 19, p. 459), the author on the basis of personal experience and other data discusses the palatibility and wholesomeness of spleens and their preparation for the table, and points out that although raw spleens do not keep well, the cooked material, particularly when boiled, has excellent keeping qualities. Attention is also directed to the high iron and phosphoric acid content of spleens.

The cooking of legumes (*Pure Products, 4 (1908), No. 6, pp. 252–254*).—A summary and discussion of reports by Kochs on the effects of different methods of cooking hulled peas, green peas, and lentils. Under all experimental conditions the largest amount of material was removed from hulled peas, as is natural, since the skin if present hinders extraction. More material was removed by combined soaking and boiling than by either process alone.

The book of fruit bottling, Editii Bradley and May Crooke (*London, 1907, pp. XVI+97, pls. 10, figs. 7*).—A large number of recipes are given for canning, preserving, and drying fruit, and on cider making. Some information on cookery in ancient times is also summarized.

Recipes for the preserving of fruit, vegetables, and meat, E. Wagner (*New York and London, 1908, pp. VIII+119, figs. 14*).—This work contains instructions for the beginner and the expert in preserving fruits and nuts in bottles and

tins, glazed and candied fruits, fruit juices, sirups and pulps, jellies, jams and marmalades, citron and orange peels, vegetables, mushrooms and truffles, pickles and piccalilli, meats and meat pastes.

The household gas-cookery book, Helen Edden and Mrs. Moser (*London, 1908; rev. in Epicure, 15 (1908), No. 180, p. 310*).—A cook book "with a considerable amount of practical information about the use of the gas cooking range."

The up-to-date home. Labor and money-saving appliances (*Bul. Amer. School Home Econ., Ser. 1, 1908, No. 11, pp. 47, figs. 5*).—Information is given regarding a number of labor-saving devices which have been tested at the American School of Home Economics. The desirability of labor-saving devices in the home is pointed out. "Any household appliance should save more time and labor than it takes to adjust it and clean it after use. . . . An appliance should be used sufficiently often to save more time and trouble than it gives."

Refrigeration on the homestead, H. V. Jackson and A. E. Lea (*Agr. Gaz. N. S. Wales, 19 (1908), No. 7, pp. 537–552, pl. 1, figs. 9*).—A description of refrigerating machines and directions for storing eggs, fruits, vegetables, rabbits, poultry, pork, ham, bacon, and fish.

Canned meats, A. McGill (*Lab. Inland Rev. Dept. [Canada] Bul. 16, pp. 11*).—Data are given regarding the examination of 76 samples of canned and potted poultry and meats. With the exception of a sample of potted pheasant the goods "have been found in perfect condition of preservation." Boracic acid, the only preservative found, was present in 28 samples or nearly 37 per cent of the total number examined. Examinations for starch in potted meats showed that 17 samples contained less than 1 per cent, 5 samples between 1 and 2 per cent, and 8 samples above 2 per cent, while no starch, or only traces, was found in 46 samples. As the author points out, all of the samples containing above 2 per cent of starch were sold as "loaf" meats, with the exception of a sample of sausage.

On the nature and causes of taint in miscured hams, E. Klein (*Lancet [London], 1908, I, No. 26, pp. 1832–1834, figs. 3*).—According to the author's observations, the taint occasionally found in miscured hams which have undergone dry curing is due to a micro-organism which he isolated and studied and for which the name *Bacillus fœdans* is proposed.

Drawn v. undrawn poultry, E. W. Burke (*Amer. Food Jour., 3 (1908), No. 9, pp. 7–10*).—A summary and discussion of data including legal enactments regarding drawn versus undrawn poultry. More extended legislation is recommended. According to the author, arguments are all in favor of drawing poultry. As he points out, it should be carefully drawn and kept as clean as larger animals "not only for keeping qualities but for healthfulness and flavor." The article was presented at the twelfth annual convention of the Association of State and National Food and Dairy Departments, 1908.

The water content of sausage, A. Röhrig (*Ber. Chem. Untersuch. Anst. Leipzig, 1907, p. 13; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 360*).—Determinations of the water content of several sorts of sausage are reported.

Water content of sausage, H. Kreis (*Ber. Chem. Lab. Basel, 1907, pp. 21, 22; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 360*).—Analytical data are reported.

Nut sausage, G. Kappeller and W. Theopold (*Ber. Nahrmtl. Untersuch. Amt. Magdeburg, 1907, p. 22; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 361*).—An analysis is reported.

The origin, manufacture, and uses of extract of meat (*Lancet [London], 1908, II, No. 17, pp. 1233–1244, figs. 8, dgm. 1, maps 3*).—An illustrated, descriptive article on the Argentine meat extract industry.

Meat extract, A. Röhrig (*Ber. Chem. Untersuch. Anst. Leipzig, 1907, p. 11; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 361*).—Analyses of 5 samples of meat extract are reported.

The food value of the herring, T. H. Milroy (*Ann. Rpt. Fishery Bd. Scot., 24 (1905), pt. 3, pp. 83–107; 25 (1906), pt. 3, pp. 197–208; Bio-Chem. Jour., 3 (1908), No. 6–8, pp. 366–390*).—The results of an extended series of analyses of herring taken on different parts of the Scotch coast are reported and discussed with reference to the changes which the herring undergoes before, during, and after the spawning period. Phosphoric acid was determined, as well as water, protein, and fat, and in later analyses determinations were also made of the coagulable muscle proteins.

Added preservatives in fish goods, M. Kozyn (*Vyestnīk Obshch. Hig., Sudeb. i Prakt. Med., 42 (1906), pp. 1439, 1440; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 359*).—A study of the character of the preservatives and the extent to which they are used in canned fish and similar goods in Moscow.

The penguin egg (*Sci. Amer. Sup., 66 (1908), No. 1716, p. 330*).—An account of the collection and use of penguin eggs which are eaten in quantity in South Africa. The article states that the eggs are not very different in flavor from those of the common hen although the penguin feeds on fish. On cooking, the albumin does not become solidified but retains a jelly-like character and is of a bluish color. In size the egg approximates that of a goose. Successful shipments of these eggs have been made to Great Britain.

Preserved egg goods, A. Röhrig (*Ber. Chem. Untersuch. Anst. Leipzig, 1907, pp. 14, 15; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 364*).—Data given regarding the composition of 3 sorts of preserved egg goods.

Preserved egg yolk, G. Benz (*Ber. Untersuch. Amt. Heilbronn, 23 (1907), pp. 14, 15; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, p. 364*).—In this account of commercial egg yolk preparations the author declares against the use of methyl alcohol as a preservative.

Experiments on bread fermentation, A. J. J. Vandevelde, L. Bosmans and A. Revijn (*Separate from Verslag. en Meded. K. Vlaam. Akad. Taal en Letterk., 1908, pp. 493–526*).—In continuation of work previously noted (E. S. R., 20, p. 463), the authors studied the factors which affect fermentation and quality of bread.

The use of sugar in bread making as a means for increasing the consumption of sugar, F. Dupont (*Ztschr. Ver. Deut. Zuckerindus., 1908, No. 634, II, pp. 992–994*).—The addition of sugar to bread is proposed as a desirable method of increasing sugar consumption.

A new type of bread for peasants, P. Gibelli and E. Grüner (*Ann. Ist. Agr. [Milan], 7 (1905–6), pp. 95–106*).—In view of danger from pellagra a special method of bread making is described and an analysis reported in comparison with maize bread.

Potentialities of plantain meal (*Indian Agr., 33 (1908), No. 8, p. 243*).—In an article quoted from the *Indian Trade Journal* the value of plantain or banana flour is discussed and an analysis by Hooper quoted.

How to prevent checking in biscuits and crackers, W. B. Crocker (*Rpt. Ann. Meeting Biscuit and Cracker Manfrs.' Assoc., 1908, pp. 16–18*).—On the basis of experience the author discusses the cause and prevention of checking in crackers and similar goods. The importance of flour of the right degree

of strength, proper mixing, baking, and similar features are insisted upon, and the flour used, it is stated, should be at least 70° F. in temperature.

The molecular weight of dextrin of honey from Coniferæ, H. Barschall (*Arb. K. Gsndhtsamt., 28 (1908), pp. 405–419; abs. in Chem. Zentbl., 1908, II, No. 1, p. 91*).—It is considered probable that the honey dextrin under consideration is a trisaccharid, though more data regarding its chemical nature are considered desirable.

The composition of pineapples, W. Bonewitz (*Chem. Ztg., 32 (1908), No. 15, pp. 176, 177; abs. in Chem. Abs., 2 (1908), No. 10, p. 1466*).—The data reported include proximate and ash analyses.

Spoiled plum jam, P. Köpcke (*Pharm. Zentralhalle, 49 (1908), pp. 376, 377; abs. in Chem. Zentbl., 1908, II, No. 1, pp. 91, 92*).—An analysis is reported of spoiled plum jam in comparison with analyses of 2 samples of normal taste and appearance.

Olive oil, A. McGill (*Lab. Inland Rev. Dept. [Canada] Bul. 159, pp. 10*).—Of 82 samples of olive oil examined 64 were found to be genuine and 15 adulterated, while 3 samples which were sold as salad oil without the use of the word "olive" were designated as doubtful.

New experiments on olive preservation, G. Frezzotti (*Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 7 (1908), IV, No. 9, pp. 893–898*).—Experiments on different methods of preserving olives for oil making are reported and discussed.

Treatment of green olives which have undergone fermentation due to Bacterium coli commune, A. Kossowicz (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 9, pp. 725–727*).—According to the author, olives in which fermentation had been caused by *Bacterium coli commune*, and which possessed a disagreeable odor, became of good odor and appearance after treatment with a 2 per cent solution of common salt and sour milk.

Swedish berry and fruit wines, O. Hofman-Bang (*Pomol. Fören. Årsskr., 1908, Feb., Svensk Kem. Tidskr., 20 (1908), No. 5, pp. 90–93*).—Analyses of domestic wines are given, with discussions of the results obtained.

Some notes on claret, P. Schidrowitz (*Jour. Inst. Brew., 13 (1907), No. 4, pp. 302–319; Rev. Soc. Sci. Hyg. Aliment., 4 (1907), No. 2, pp. 52–64*).—The relations between quality and chemical composition were studied. Analyses of clarets at different stages indicated that as it grows older the amount of glycerin increases, the amount of alcohol, extract, ash, sugar, and tannin usually decreases, and the percentage of acidity is variable.

Analyses of malt liquors (*Mo. Bul. N. Y. State Dept. Health, 24 (1908), No. 8, pp. 213–216*).—The results of the examination of 219 samples of beers brewed in the State are reported with special reference to the use of hop substitutes and preservatives. Sulphites were found in the majority of the samples and salicylic acid, saccharin, or fluorids in a very few samples. No hop substitutes were noted.

Pickles, A. McGill (*Lab. Inland Rev. Dept. [Canada] Bul. 163, pp. 14*).—The author reports the results of the examination of 149 samples of pickles collected in Canada. With two exceptions the pickles were in good condition. Evidently both of the unsatisfactory samples were prepared with weak vinegar or the vegetables used contained so much water as to dilute the vinegar, the respective strengths being 1.02 and 0.61 per cent of acetic anhydrid.

To determine whether alum was used in making pickles, the goods were examined for soluble alumina and it was found to be present in 25 of the samples.

"It would not, however, be safe to infer the use of alum in every case in which a reaction for alumina was obtained. Owing to the prone habit of cucumbers, and the liability to take up, in the creases of the pericarp, minute

particles of clay, and further to the possibility of a slight solubility of such clay by prolonged contact with acetic acid, it may be that, where merely traces of alumina were found, these may be accounted for, as above suggested. It is, however, noteworthy that 124 samples gave no reaction with tests for alumina. This fact seems to warrant the conclusion that, where distinct traces of alumina are found in solution, the use of alum is indicated."

Twelve of the samples gave reactions for salicylic acid and an equal number for sulphurous acid. No other preservative (except vinegar) was found. In the greater part of the samples the strength of the vinegar ranged from 1.5 to 3 per cent acetic anhydrid.

Changes produced in mustard by proteus and the poisoning which follows, E. Bertarelli and M. Marchelli (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, pp. 353–359*).—An experimental study of the changes produced in mustard by the growth of micro-organisms.

Adulteration in red pepper, P. Grandmont (*Bul. Agr. Algérie et Tunisie, 14 (1908), No. 17, pp. 436–438*).—Data are given regarding the examination of adulterated red pepper in comparison with a sample of known quality.

Pepper adulterated with vetch seeds, Fleury (*Trav. Sci. Univ. Rennes, 6 (1907), No. 1, pp. 140–142*).—A summary and discussion of data on this topic.

Influence of preservatives and other substances added to foods upon health and metabolism, H. W. Wiley (*Proc. Amer. Phil. Soc., 47 (1908), No. 189, pp. 302–328, fig. 1*).—A summary of the results of the author's investigations with preservatives. His deduction is, that if the conclusions based upon experimental data are correct there can be no justification of the addition of chemical preservatives to human foods and, furthermore, "successful manufacturing establishments have demonstrated beyond peradventure that better, more wholesome, and more permanent forms of food products can be produced without the aid of any preservative whatever."

Nitrous acid as an antiseptic, J. H. Shepard (*Bul. Kans. Bd. Health, 4 (1908), No. 9, pp. 225–231; Pure Products, 4 (1908), No. 10, pp. 455–463; Amer. Food Jour., 3 (1908), No. 9, pp. 11–14, fig. 1*).—In a paper presented before the twelfth annual convention of the Association of State and National Food and Dairy Departments, 1908, the author reports the results of studies undertaken to determine whether nitrous acid hindered ferment action. Varying strengths were used in tests made with starch and diastase, with starch and ptyalin, with starch, pepsin, and egg albumin, and with starch and pancreatin, and it was found that even in high dilution digestion was retarded. "Any chemical in dilution of 1 part to 100,000 which will retard digestion nearly 25 per cent should not be permitted in any food product in any quantity whatever. And more especially is this true in the case of flour. . . . The addition of nitrous acid to flour is not only useless, it is dangerous."

If white bread is desired, the author suggests that it be secured by thoroughly aerating the dough and not by bleaching.

Benzoic acid, K. B. Lehmann (*Chem. Ztg., 32 (1908), No. 79, pp. 949–952*).—A digest of available data regarding the nature and hygienic effect of this preservative.

The influence of soaking on the boric acid content of canned goods, A. Röhrig (*Ber. Chem. Untersuch. Anst. Leipzig, 1907, p. 13; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, pp. 359, 360*).—The amount of boric acid in canned goods was found to be diminished by washing or soaking.

Food analysis No. 16, E. H. S. Bailey and H. L. Jackson (*Bul. Kans. Bd. Health, 4 (1908), No. 6, pp. 148–150*).—Data are given regarding the examination of beverages, extracts, vinegar, sugar, and baking powder.

Food analysis No. 18. J. T. Willard (*Bul. Kans. Bd. Health, 4 (1908), No. 9, pp. 212–221*).—Examinations made under the State pure food law are reported of a large number of samples of vinegar, milk and cream, ice cream, beverages, and miscellaneous food products.

In connection with the question of testing for sulphites in foods, samples of green sweet corn, raw and cooked in different ways, were distilled with dilute phosphoric acid. "The distillate was oxidized by bromin water and tested for sulphuric acid with barium chlorid in the usual way." In every case a precipitate was obtained, showing that some sulphur compound is cleaved from the fresh corn under the experimental conditions. The evolution of sulphur from vegetable substances was still further tested with fresh sweet potatoes, tomatoes, cucumbers, cabbage, string beans, peas, celery, and onions, and sulphur was found in the distillate in all cases except with cucumbers and peas.

Foodstuffs. D. Hooper (*Ann. Rpt. Indian Mus. Indus. Sect., 1907–8, pp. 19–21*).—An analysis of bark used as food is reported as well as data regarding the examination of samples of rice, ragi tailings, tamarind seed, castor meal, sugars, and a tea substitute.

The new Kentucky foods and drugs act. M. A. Scovell (*Amer. Food Jour., 3 (1908), No. 9, pp. 14, 15, 21*).—In this paper presented before the twelfth annual convention of the Association of State and National Food and Dairy Departments, 1908, the author discusses legislation recently enacted in Kentucky regarding foods and drugs.

Dairy and food laws of the State of Washington (*Olympia, Wash., 1907, pp. 34*).—A compilation of the dairy and food laws in the State of Washington enacted up to the close of the legislative session of 1907.

Legislation for the control of adulteration and falsification of food products. M. Toubeau (*La Législation Répressive des Fraudes et Falsifications sur les Produits Alimentaires. Thesis, Univ. Paris, 1908, pp. 275*).—An historical and critical digest of pure food legislation in France. In an appendix pure food legislation in some other countries is briefly summarized.

Progress in the chemistry of food and condiments in the year 1907. H. Kuttenkeuler (*Chem. Ztg., 32 (1908), Nos. 59, pp. 693–695; 60, pp. 709–711; 61, pp. 720, 721*).—A summary of investigations which have been reported along the principal lines of food chemistry.

Food and nutrition laboratory manual. Isabel Bevier and Susannah Usher (*Boston, 1908, pp. 75*).—In this revision results of investigations published since the first edition appeared (E. S. R., 18, p. 562) have been included.

On the assimilation of protein introduced parenterally. W. Cramer (*Jour. Physiol., 37 (1908), No. 2, pp. 146–157*).—The results obtained in the investigations show, according to the author, "that protein which has passed unchanged through the intestinal wall can be assimilated and evidence is adduced to show that this assimilation is brought about by the leucocytes ingesting the protein.

"This leads naturally to the question whether such an assimilation of unchanged protein takes place at all after a meal and whether the mechanism of the assimilation of the protein of the food from the intestinal canal is similar to the processes which regulate the assimilation of protein introduced into the peritoneal cavity.

"The fact that the mechanism of the assimilation of protein from the peritoneal cavity works under the most favorable conditions after a meal suggests that unchanged protein is absorbed and assimilated under normal conditions."

From the experimental evidence presented it follows, according to the author, that protein is "assimilated normally without being broken down in the intestine. Such a process takes place of course only to a limited extent and not

to the exclusion of other processes, such as the absorption and assimilation of the more advanced products of digestion of the protein of the food."

On the assimilation of protein introduced enterally, H. Pringle and W. Cramer (*Jour. Physiol., 37 (1908), No. 2, pp. 158–164*).—The results of the investigations show "that the intestinal mucous membrane of digesting animals is very much richer in incoagulable nitrogen than that of fasting animals. The most pronounced difference is found in the lymphoid nodules of the intestinal wall, where the residual nitrogen appears to be collected.

"The blood of digesting animals shows a small but distinct increase of residual nitrogen over the blood of fasting animals."

In general the results are analogous to those noted above "and allow the conclusion that the assimilation of protein from the intestinal canal is brought about partly at any rate by the agency of the leucocytes. Part of the nitrogenous material may be absorbed by a different path and undergo a different fate."

Studies of the precipitin reaction and heated proteins, W. A. Schmidt (*Biochem. Ztschr., 14 (1908), No. 3–4, pp. 294–348*).—From his studies of the precipitin reaction the author concludes that the animal body possesses the ability to regenerate proteids so that the original characteristics are apparent even if the proteids have been acted upon by heat, alkalis, and enzyms.

Assimilation of animal and vegetable fat by man, V. Gerlach (*Ztschr. Diätet. u. Phys. Ther., 12 (1907), p. 102; abs. in Biochem. Centbl., 7 (1908), No. 13, pp. 497, 498*).—From experiments of long duration of which he himself was the subject the author reached the conclusion that there was no difference in the digestibility of animal and vegetable fats. The materials used were butter and a commercial butter substitute prepared from cocoanut fat.

The uric acid excretion of normal man, P. J. Hanzlik and P. B. Hawk (*Jour. Biol. Chem., 5 (1908), No. 4, pp. 355–359*).—The conclusions drawn from the experiments reported follow:

"The average daily excretion of uric acid for 10 men, ranging in age from 19 to 29 years, and fed a normal mixed diet was 0.597 gm., a value somewhat lower than the generally accepted average of 0.7 gm. for such a period.

"The average daily protein ingestion for these same subjects, when permitted to select their diet, was 91.2 gm. or 1.33 gm. per kilogram of body weight."

Experiments on the daily variation in the work of the kidneys on a constant diet, M. Braeuner (*Ztschr. Klin. Med., 65 (1908), p. 438; abs. in Zentbl. Gesam. Physiol. u. Path Stoffwechsels, n. ser., 3 (1908), No. 20, p. 789*).—Wide variations were noted in the nitrogen and chlorin excretion and the molecular diuresis on diets with both a limited and a normal amount of common salt.

Increased body temperature of men working in hot climates, S. Kurita (*Arch. Schiffs u. Tropen Hyg., 11, (1907), No. 21, pp. 681–683*).—Observations made with stokers showed increased body temperature, pulse rate and rate of respiration as compared with engineers working at a somewhat lower temperature. After about 2 hours the body temperature again dropped to normal. The author concludes therefore that at least 2 hours' rest is essential after work has been performed where the air is excessively hot.

The minimum physiological energy requirement, J. Lefevre (*Jour. Physiol. et Path. Gén., 9 (1907), pp. 939–947; abs. in Bibliographia Physiol., 3. ser., 3 (1907), No. 3–4, p. 275*).

Direct calorimetric measurement of the minimum physiological energy requirement, J. Lefevre (*Jour. Physiol. et Path. Gén., 9 (1907), pp. 969–977; abs. in Bibliographia Physiol., 3. ser., 3 (1907), No. 3–4, p. 275*).—According to the author all heat in excess of 1,450 calories per day eliminated by the

human body is heat of thermo-genesis; that is, it is produced for maintaining the body temperature.

ANIMAL PRODUCTION.

The improvement of the Alpine region as a stock raising country (*Ann. Sci. Agron., 3. ser., 3 (1908), 1, pp. 114–133*).—A report by various authors to the Eighth International Congress, held at Vienna in May, 1907, which emphasizes the need of improving the pastures and other natural resources of the region adapted for stock raising.

Hays of southern Italy. F. Scurti and G. de Plato (*Staz. Sper. Agr. Ital., 41 (1908), No. 7, pp. 333–434*).—This contains tables showing the botanical and chemical analyses of 47 samples of hay collected from different localities in southern Italy. About 50 per cent of the plants which composed the hay were true grasses, 25 per cent legumes, and 25 per cent of different families. Samples with approximately this ratio of species contained from 7.09 to 13.89 per cent of protein, 10.16 to 22.59 carbohydrates, and 1.79 to 3.01 per cent of fat. A bibliography is included.

The available energy of red clover hay. H. P. Armsby and J. A. Fries (*Landw. Jahrb., 37 (1908), No. 3–4, pp. 423–495*).—A German translation of Bulletin 101 of the Bureau of Animal Industry of this Department, already noted (E. S. R., 19, p. 866).

Preservation of frozen turnips as ensilage. Fingerling (*Württemb. Wchnbl. Landw., 1908, No. 44, p. 739*).—The author recommends storing frozen turnips, which would otherwise be wasted, in pits and mixed with straw and chaff. The hole should be covered with a plank or a thick layer of straw and heavily weighted.

The grape as a feed for animals (*Indus. Latt. e Zootec., 6 (1908), No. 20, pp. 229, 230*).—A discussion of the nutritive value of different parts of the grapevine, with analyses.

The use of grapevine prunings as forage. K. Portele, trans. by E. Ottavi (*Coltivatore, 54 (1908), No. 41, pp. 459–462*).—The waste twigs cut from grapevines possess 55 to 60 per cent as much nutrient matter as meadow hay. They should be ground up and fed in moderate quantities.

Concentrated feeding stuffs. A. Maurizio (*Kraftfuttermittel. Hanover, 1908, pp. IV+112*).—A short treatise on animal feeding stuffs that have a higher nutritive value than hays. It includes grains, leguminous hay, molasses, meat meal, and factory by-products.

Feeding stuffs. H. E. Annett, F. V. Darbishire, and E. J. Russell (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 201–214*).—The substances analyzed are linseed cake, cocoanut cake, maize germ meal, rice meal, edible seaweed, and silage.

[Analyses of stock feeds]. H. Ingle (*Transvaal Dept. Agr. Ann. Rpt. 1907, pp. 249–263*).—This report contains analyses of forage crops and of the "joegee" bean, already noted (E. S. R., 19, p. 1166). In addition, analyses are given of peanuts, maraamas (*Bauhinia* sp.?), sugar beets, and chicory.

Residual products of oil factories as animal foods. A. Nardini (*Istria Agr., 1 (1908), No. 22, pp. 476–479*).—Analyses are given of the residues from the manufacture of linseed, sesame, peanut, and cocoanut oils.

Starch in feedstuffs. M. H. Davis (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3316, pp. 4, 5*).—American corn feeds may be imported to Germany free of duty if they contain less than 35 per cent of starch, but German methods of determining starch content are so different from American methods that a feed which passes in this country as containing 32 to 35 per cent of

starch yields, when subjected to German tests, about 50 to 55 per cent. The method of determination now used in Germany is described in detail. It is known as the diastase method and was first described in the fifth edition of Max Maercker's Handbuch des Spiritusfabrikation, in 1908.

Gluten feeds—artificially colored, E. GUDEMAN (*Jour. Amer. Chem. Soc., 30 (1908), No. 10, pp. 1623–1626*).—Examinations made during the past year of 90 samples of gluten feeds have shown that 68 samples, or over 75 per cent of those examined, have contained added coloring matter. "Of 6 samples received direct from manufacturers, only 1 showed a very slight amount of added color.

"Examinations made on different kinds of corn, ranging from white to dark red, and on the component parts of corn (bran, germ, and gluten), in all cases gave negative results for added color, tested under like conditions with the gluten feeds. The evaporated steep-water often gives a faint color reaction, similar to caramel (sugar) coloring, on the first wool samples. . . .

"The purpose of adding color to gluten feeds is only for deception, to make them appear better than they really are or to hide some inferiority, such as the use of rotten, burnt, or fermented corn."

The methods of examination are described in detail.

Cyclopedia of American agriculture.—Animals, L. H. BAILEY ET AL. (*New York, 1908, vol. 3, pp. XVI+708, pls. 25, figs. 681*).—As in the first two volumes of this cyclopedia (E. S. R., 18, p. 1088; 19, p. 733) the various topics are written by specialists.

This third volume is divided into three parts. Part 1, the animal and its relations, treats of the domestication, breeding, feeding, exhibiting and marketing of animals, the physiology of the animal body, diseases and management, and wild life in its relation to farming. Part 2 treats of dairy products, meat and meat products, including the tanning of hides, and an account of the leather industry. Part 3 takes up at length the North American farm animals, and discusses the origin and characteristics of the various breeds of live stock now found in the United States and Canada.

Heredity, J. A. THOMSON (*London, 1908, pp. XVI+605, pls. 15, figs. 34*).—This book, which is intended as an introduction to the study of heredity, includes 14 chapters, a representative bibliography of 48 pages arranged in alphabetical order, and a 20-page subject index to the bibliography. The subject is considered under the following chapter headings: Heredity and inheritance, defined and illustrated; the physical basis of inheritance; heredity and variation; common modes of inheritance; reversion and allied phenomena; telegony and other disputed questions; the transmission of acquired characters; heredity and disease; statistical study of inheritance; experimental study of inheritance; history of theories of heredity and inheritance; heredity and development; heredity and sex; and social aspects of biological results.

Inbreeding, Mendelism, and the elucidation of live stock history, J. WILSON (*Irish Nat., 17 (1908), No. 11, pp. 243, 244*).—This is an abstract of a paper read at the Dublin meeting of the British Association for the Advancement of Science.

The author emphasizes the advantages of inbreeding, and cites the deer as an example in nature. "The strongest male retains command of a flock until he is ousted by some other animal, who is in all probability a younger brother or a son of the previous master male." The various theories of the origin of the Dexter breed of cattle are reviewed and discarded. "Mendelism shows clearly that the Dexter is a hybrid breed, the original races being a slender black race and a stout red one like the Devon breed of cattle. . . . Mendelism is evidently going to be of great service to the historian of live stock."

Color of Shorthorn cattle (*Country Life [London]*, *24 (1908)*, *No. 618*, *pp. XLVIII, L*).—Brief notes on Mendelism in Shorthorn cattle. Offspring of white and roan ancestors reported as red generally prove to have more or less white hair. Mendel's law reveals the importance of more accurate descriptions in the herd book.

The cost of producing beef in winter, K. J. J. MACKENZIE (*Jour. Bd. Agr. [London]*, *15 (1908)*, *No. 4*, *pp. 253–260*).—A discussion of results previously noted (E. S. R., 10, p. 773; 18, p. 666).

Feeding experiments with mature oxen and sheep (*Landw. Wchnschr. Sachsen*, *10 (1908)*, *No. 38*, *pp. 332*, *333*).—A ration low in protein fed to 8 oxen for 3 months showed a total gain of 900 lbs., as compared to a similar gain of 720 lbs. on a ration high in protein. In the latter ration there was an actual loss of 60 lbs. during the last 20 days of the experiment. When similar rations were fed to sheep, however, there was a total gain of 1,014 lbs. at a cost of 8.9 cts. per pound on the ration poor in protein, and a similar gain of 1,268 lbs. at a cost of 7.8 cts. per pound on the ration rich in protein.

Breeding sheep for mutton, G. M. MCKEOWN (*Agr. Gaz. N. S. Wales*, *19 (1908)*, *No. 6*, *pp. 489–496*, *figs. 6*).—Various crosses have been tried to ascertain the most profitable sheep for the small land owner in New South Wales. A lamb that can be sold at 4 or 5 months of age is desired, and so far the best results have been obtained from a Shropshire ram and a Lincoln-merino ewe. The author discusses the best crops for mutton production.

Sheep raising for the production of wool in western Africa, Y. HENRY (*Agr. Prat. Pays Chauds*, *8 (1908)*, *No. 66*, *pp. 182–192*, *figs. 3*).—Methods of raising sheep and marketing wool as practiced in the Soudan are described.

Goats (*Jour. Jamaica Agr. Soc.*, *12 (1908)*, *Nos. 4*, *pp. 102–104*; *10*, *pp. 337–340*).—The types of goats kept on the island are the Maltese, Anglo-Nubian, and Swiss-Toggenburg for milk, the common Jamaica goat for mutton, and the Angora for mutton and hair. The keeping of pedigreed animals for milk and mutton is advocated. The subjects of breeding and management are discussed.

The value of potatoes for pig feeding in rations with different protein content, O. KELLNER ET AL. (*Bericht des Deutschen Landwirtschaftsrats an das Reichsamt des Innern betreffend Mästungsversuche mit Schweinen über die Verwertung der Kartoffeln bei Verschiedener Eiweisszufuhr. A. Allgemeiner Bericht*, *pp. 32*; *B. Berichte über die Einzelnen Versuche*, *pp. 215. Berlin*, *1908*).—That potatoes are the best home-grown substance for pig feeding is reported as the result of a cooperative series of experiments carried on at 17 different stations under the direction of the German Agricultural Society to estimate the value of potatoes when fed in varying proportion with supplementary protein feeds. Skim milk, meat meal, fish meal, bran of grains, husks of fruits, and oil cake were the supplements used. The normal ration proposed was 6.2 kg. protein per 1,000 kg. live weight for pigs weighing 20 kg., but the proportion of protein was decreased as the animals grew older, so that when animals had reached 130 kg. in weight they would receive for the normal ration only 2.4 kg. protein per 1,000 kg. live weight.

The experiments showed that steamed potatoes were an excellent food for fattening swine, this agreeing with practical experience. It is stated that potatoes can compose 50 to 60 per cent of the digestible carbohydrates of the ration and in some cases even more. An increase of protein above the normal amount was found to be of no advantage, a large increase producing lameness. A decrease of 15 to 20 per cent of normal protein diminished the live weight and increased the amount of carbohydrates consumed, yet where a slow fattening with cheap foods is desired it is believed that a slight decrease in protein may be allowed.

Specific favorable or unfavorable effects of the different protein supplements or mixtures were not observed either in the animal or in the slaughtered product. The average cost of producing 100 kg. live weight with proper food was 74 marks (about 8.1 cents per pound). The potatoes were estimated to be worth 3 marks per 100 kg. (about 19 cts. per bushel).

Pig feeding experiments with skim milk, Klein (*Milchw. Zentbl., 4 (1908), No. 8, pp. 362–370*).—Experiments previously reported (E. S. R., 19, p. 171) showed a gain proportional to the amount of skim milk when pigs were fed a wide ration. In continuing the work narrower rations were fed when it was found to be of no advantage to feed large amounts of skim milk. Four pairs of pigs about 15 weeks old, weighing 30 kg. each, were fed for 22 weeks, each lot receiving 272 kg. of ground barley. The pair fed in addition 770 kg. of skim milk, 432 kg. of potatoes, and 31 kg. of fish meal gained 0.687 kg. (about 1.51 lbs.) per head per day. The pair receiving 1,440 kg. skim milk and 402 kg. potatoes gained 0.646 kg. (about 1.42 lbs.) per day. The third pair, receiving 1,400 kg. skim milk, 370 kg. potatoes, and 31 kg. fish meal, gained 0.698 kg. (about 1.54 lbs.) per day, and the fourth which received 2,030 kg. skim milk, and 39 kg. potatoes, gained 0.659 kg. (about 1.45 lbs.) per day. There was little difference in percentage of dressed weight. Analyses of the feeding stuffs are given.

Feeding experiments with pigs, Klein (*Milchw. Zentbl., 4 (1908), No. 11, pp. 481–488*).—Continuing the feeding experiments noted above, 12 pigs were divided into 3 groups and fed for 56 days a basal ration of barley, dried potatoes, and skim milk. In the first group each pig received in addition cocoanut oil and made an average daily gain of 0.373 kg. (about 0.82 lb.). In group 2 the supplementary feeding stuff was potato starch inverted with diastasolin and the average daily gain per head 0.416 kg. (about 0.91 lb.). Group 3 was fed ordinary potato starch and gained an average of 0.374 kg. (about 0.82 lb.) per head per day.

Monographs on useful farm animals, VII. The East Friesian horse, H. Gross (*Monographien Landwirtshaftlicher Nutztiere VII. Das Ostfriesische Pferd. Hanover, 1908, pp. 117, pls. 5, figs. 95, dgm. 1, map 1*).—This monograph treats of East Friesland and its adaptability for the production of horses.

Much space is given to the origin and history of the East Friesian breed. This is often confounded with the Oldenburg, as the two breeds have many characteristics in common. Again, individuals of this breed are often seen in fine turnouts but erroneously supposed to be of English origin. The aim of the breeders is to produce a strongly built first-class roadster. The color varies from black to the various shades of brown, with white points. Improvement of the breed began at the beginning of the eighteenth century. A registry of merit was kept between 1708 and 1725, but is now lost. Stallions have been imported from various countries, but foreign blood is not in favor at the present time. The present stud book was begun in 1869. There are 28,318 horses in East Friesland. In 1907, 120 stallions of this breed were exported to the United States. The characteristics of the breed are fully described, including measurements of stallions.

Public measures for advancing the poultry industry in Germany, O. Knispel (*Arb. Deut. Landw. Gesell., 1908, No. 145, pp. XXVI+346, figs. 14, map 1*).—This is a collection of data on the breeds of poultry, methods of management, breeding stations, poultry schools, and associations for promoting the poultry industry in the several German states. With the text is a map showing the geographical distribution of the various breeds. Bavaria leads in the number of common fowl, in geese, and in the total of all kinds of poultry,

having 9,111,884 individuals. Posen, with 22,085 guinea hens and 44,854 turkeys, leads in these two species. Bremen, with 4.08 head per hectare (about 1.7 head per acre), has more poultry for its size than any other state. Oldenburg has 2.22 fowls per inhabitant and leads in this respect.

The most influential means for promoting the industry is considered to be through the establishment of breeding stations. There are 2,995 of these in the Empire, and 1,173 of them contain Italian breeds, these being most frequent in Bavaria. Next to these are the Wyandottes with 347 stations, Minorcas with 254, and Plymouth Rocks with 91. The Wyandotte and Plymouth Rock stations are more numerous in Posen than elsewhere.

Elementary analysis and distribution of nitrogen in eggshells of different sorts, H. Buchtala (*Ztschr. Physiol. Chem., 56 (1908), No. 1 pp. 11–17; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 549, II, p. 610*).—The membrane lining of hen's egg was examined in comparison with the shells or membranes of eggs of other sorts.

A review of investigations in animal nutrition by German investigators in the second half year of 1907, W. Zielstorff (*Chem. Ztschr., 7 (1908), No. 18, pp. 197–208*).

DAIRY FARMING—DAIRYING—AGROTECHNY.

Feeding experiments with milch cows, G. von Zweigbergk (*Östergöttlands Läns Hushåll. Sällsk. Handl., 1908, No. 2, pp. 156–163*).—Eight cows, separated into 2 lots of 4 each, were fed normal rations of hay, straw, mangels, mixed barley and oats, wheat bran, and oil cake, and during brief experimental periods the oil cake in the rations, amounting to 2 kg. per head per day, was replaced by an equal weight of gray or yellow peas. The quantity of milk produced did not appear to be influenced by the change, but the fat content of the milk was uniformly lower when peas were fed, and the butter made from the milk was of inferior quality. Even when only 0.5 kg. peas per head daily was fed the quality of the butter produced was not up to the standard. Trials with other legumes (horse beans and several vetches), gave similar results, but the horse beans were found less objectionable than the peas or vetches.

Report of Malmöhus County cow-testing association, 1907–8, L. Nanneson (*Malmö. Läns Hushåll. Sällsk. Kvrlsskr., 1908, No. 2, pp. 367–529*).—The report gives a detailed account of the work of 115 different test associations in existence in the county during the year. Twenty-five new associations were also formed, making 144 associations in operation at the close of the year, with over 2,000 herds and about 50,000 cows, or about one-third of the total number of cows in the county. The average yield per cow for the year for the 115 associations (1,590 herds, 38,237 cows) was 3,506 kg. (7,713 lbs.) milk, and 111.37 kg. (251.6 lbs.) butter fat, as compared with 3,377 kg. milk and 109.03 kg. butter fat for the preceding year (1,261 herds), and 2,849 and 91.3 kg. of milk and butter fat, respectively, for 1901–2 (327 herds). The average rations fed consisted of hay and straw 24 per cent, green feed and pasture 24 per cent, roots 12 per cent, bran and small grains 12 per cent, oil cakes 18 per cent, and miscellaneous feeds 10 per cent.

Cow-testing associations in Norway, 1906–7, L. Funder (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1907, Statsforanstalt., pp. 563–638*).—During the year 132 associations comprising 22,764 cows were in operation. The average yield of milk for the year was 2,026 kg. (4,457 lbs.), and the average percentage of fat 3.48, equivalent to 70.5 kg. (155.1 lbs.) butter fat.

Milking appliances and milking machines, A. Rosam (*Österr. Molk. Ztg., 15 (1908), Nos. 18, pp. 241–243, figs. 14; 19, pp. 255–258, figs. 25; 20, pp. 269–271, figs. 8; 21, pp. 283–285, figs. 5*).—Descriptions and illustrations of various appliances for milking otherwise than by hand, including milking tubes, milking machines that force the milk out by pressure, and suction milking machines.

Milking machines, B. Böggild (*Mælkeritid., 21 (1908), No. 30, pp. 556–563*).—An address discussing the problem of machine milking, especially with the Vitula and the Lawrence-Kennedy-Gillies machines. The author concludes that it is too early as yet to recommend in general the installation of either machine on Danish dairy farms.

Dairying in southern Brazil, A. Redacção, B. Bernardino, and L. Granato (*Cent. Econ. Rio Grande do Sul Bol. 3, pp. 59, figs. 4*).—An account of the dairy industry and the methods employed in dairy husbandry in the State of Rio Grande do Sul. Analyses of milk are given.

Dairying in Finland, E. Konradi (*Mælkeritid., 21 (1908), No. 39, pp. 717–730*).—A general discussion of the conditions of the dairy industry in Finland.

Report of the experiment station and dairy institute at Kleinhof-Tapiau for the years 1907 and 1908, Hittcher (*Ber. Vers. Stat. u. Lehranst. Molkw. Kleinhof-Tapiau, 1907–8, pp. 27*).—This report contains analyses of human milk, records of the dairy herd, and related matters.

The lecithin content of milk, J. Nerking and E. Haensel (*Biochem. Ztschr., 13 (1908), No. 5–6, pp. 348–353; abs. in Analyst, 33 (1908), No. 393, pp. 470, 471*).—The lecithin content of various milks was estimated. Alcohol was added to the milk and the precipitate extracted with chloroform. The filtrate was evaporated, extracted with chloroform, and the two extractions united and evaporated. The residue, after the addition of sodium carbonate and potassium nitrate, was then ignited. The phosphoric acid in the ash was next separated with molybdic acid and weighed as magnesium pyrophosphate. The average percentage of lecithin and cephalin present in human milk was 0.05, cows' 0.063, asses' 0.16, sheep's 0.083, goats' 0.049, and mares' 0.011.

[Bacteriological studies of milk], W. G. Savage (*Ann. Rpt. Local Govt. Bd. [Gt. Brit.], 36 (1906–7), pp. 205–236, fig 1*).—Studies were made of leucocytes, streptococci, staphylococci, and a few pathogenic forms of bacteria found in milk.

The streptococci from individual cows differ from those of cow dung both in regard to their morphology and their action upon the different sugar alcohols. "The most frequently present group is a long chain form which ferments lactose, saccharose, and raffinose, coagulates milk, and usually ferments salicin. Twenty-two members of this group were located." These streptococci were not pathogenic when tested on mice.

The ordinary staphylococci were found in nearly all samples of milk, but as far as tested all were nonpathogenic. Staphylococci which form some translucent colonies were often present. Diptheroid bacilli and *Bacillus coli* were sometimes found. Streptococci were abundant but had no relationship to the number of leucocytes present. "An excess of leucocytes may be due to the conditions associated with a diminution of the milk in the later stages of pregnancy. It may be due to some old injury or inflammation, all traces of which have been removed when ordinary methods of examination are used. . . . On the other hand, the presence of streptococci is frequently a purely saprophytic phenomenon. In other cases it is probably associated with some local teat condition which does not affect the number of leucocytes, while only in certain cases is their presence in direct relationship to pathological conditions, causing a great increase in the number of leucocytes."

Studies of the so-called sterilized market milk, O. Knüsel (*Studien über die Sogenannte Sterilisierte Milch des Handels. Inaug. Diss., Univ. Zürich, 1908, pp. 79*).—The literature on the subject is reviewed at length and an account is given of the author's study of sterilized milk which he finds to be a very variable product.

Of 175 samples of "sterilized" milk 63 contained germs. A perfect sterilization is wellnigh impossible without cooking the milk, for the spores of anaerobic and proteolytic forms are very resistant to heat. The author follows Weber in dividing peptonizing bacteria into two groups, according to the rapidity of protein hydrolysis. A third group, however, is necessary, for a few species produce neither coagulation nor peptonization. The anaerobic bacteria are not of much importance in sterilized market milk.

The peptonizing bacteria produce a rennet ferment, a proteolytic ferment, a reductase, and a superoxydase. Arnold's test with guaiac and Storch's reaction both gave negative results for oxydase. Bacteria rennet is different from animal rennet. It coagulates sterilized milk and is active at 60° C. as well as at 37°, but ceases to act below 22°. The proteolytic ferment acts at a lower temperature than the rennet, hence milk may become bitter yet not coagulate. When proteolysis takes place at 8° no serum zone is found and the nutrient medium takes on a soapy appearance, which is not noticed when milk is kept in opaque receptacles. The superoxydase is united to the fat globules and is destroyed by boiling. To retard peptonization milk must be under 8°. The peptonizing bacteria form nitrates and nitrites on different nutrient media. They also form ammonia and hydrogen sulphid, but do not produce indol to any extent.

Milk and its relation to infectious diseases, J. W. Trask (*Jour. Amer. Med. Assoc., 51 (1908), No. 18, pp. 1491–1496*).—A review of investigations by different observers concerning milk and butter as carriers of typhoid fever, scarlet fever, diphtheria, and tuberculosis germs.

The supervision of the milk supply in towns and cities and the preparation of germ-free milk for children, Bettendorf and Stier (*Ztschr. Fleisch u. Milchhyg., 19 (1908), No. 2, pp. 64–75*).—A lecture before the German Society of Naturalists and Physicians at Cologne, September 20, 1908. The stringent supervision by physicians of the quality of the milk supply is insisted upon. The methods of detecting adulterants and estimating the bacterial content are reviewed. Directions are given for preparing milk for bottle-fed infants.

Chicago pasteurizing rules (*Pacific Dairy Rev., 12 (1908), No. 42, pp. 12, 13*).—Chicago is the first large American city to make pasteurization compulsory. Every pint of milk sold in that city must come from cows that have passed the tuberculin test or be subjected to pasteurization, and every pound of dairy products must come from such cows or made from pasteurized milk. The rules are given in full.

Process and apparatus for keeping milk sound, T. G. Mollinger and A. Romeijs (*English Pat. 25,393, Nov. 15, 1907. Jour. Soc. Chem. Indus., 28 (1909), No. 1, p. 36*).—A patented process is described by which milk is pasteurized and hermetically sealed in bottles.

The judging of milk with the aid of the fermentation test, F. Löhnis (*Milch Ztg., 37 (1908), No. 41, pp. 484, 485*).—The author advocates the use of the fermentation test as an aid in judging the purity of milk. His recent experiments indicate that 10 to 12° C. is the best temperature for keeping the milk. His methods are described in detail.

Investigations on the fatty acids of butter, M. Siegfeld (*Milchw. Zentbl., 3 (1907), No. 7, pp. 288–296; 4 (1908), No. 6, pp. 250–262; Chem. Ztg., 32 (1908), No. 42, pp. 505, 506*).—From an investigation of the properties of fatty acids the

author thinks there is little, if any, stearic acid in butter. The high melting point and the molecular weight of the fatty acids in butter would indicate a considerable amount of stearic acid, but it may be possible that this result is brought about by the formation of dioxystearic acid from the oxidation of oleic acid.

[The presence of acidity in cream starters], J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream., 26 (1908), No. 25, p. 936*).—The maximum acidity advocated by butter makers ranges from 48 to 60 cc. (Mann's test). This range in opinion is due, no doubt, to the fact that those who favor the lower figure are working with a different organism than are those who favor a higher degree of acidity.

On the influence of feed on milk and cheese, O. JENSEN (*Mælkeritid., 21 (1908), No. 38, pp. 665–689*).—The author concludes that "the quality of cheese can be influenced by the feed: this influence is, however, to a less degree a direct chemical than an indirect bacteriological one. The main factors in the manufacture of good cheese, besides expert knowledge, are healthy cows, proper cooling of the milk, and scrupulous cleanliness. These factors are of far greater importance in the manufacture of cheese than in butter making."

On the influence of feeding of root crops on Swiss cheese, BENTERUD and IVERSEN (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1907, Statsforanstalt., pp. 514–539*).—Experiments conducted at three different cheese factories gave results showing that turnips fed either in moderate quantities with considerable hay and straw and but small quantities of grain, or fed heavily in connection with a variety of feeds and considerable amounts of grain, did not produce any deleterious effect on the quality of Swiss cheese. On the contrary, in most cases the quality was improved by the feeding of turnips, even when as much as 30 kg. per head were fed daily. A relatively small number of feeding trials with turnip leaves and potatoes gave results indicating a similar beneficial effect on the Swiss cheese produced.

The contradiction between common Swiss experience and these results is probably explained by differences in the quality of the milk used. Norwegian milk requires the use of more rennet and a longer stirring after having been set than Swiss milk, and the cheese is spongy and filled with fine holes. If a higher temperature is used in after-heating the cheese becomes dry. This peculiarity of the Norwegian milk appears to be partly overcome by the feeding of roots. Apparently Swiss cheese produced from milk of root-fed cows can more readily undergo the correct fermentation than is the case when roots are not fed.

On Norwegian whey and goat cheeses and their analyses, S. HALS and E. SUNDE (*Tidskr. Kemi Farm. og Ter., 5 (1908), Nos. 13, pp. 8; 16, pp. 10*).—Descriptions and analyses of the different kinds of Norwegian whey and goat cheeses are given. The authors studied methods of identification of goat-milk fat for the purpose of establishing adulterations of goat cheese with cows' milk. The most promising method of identification is the ratio between Polenske and Reichert-Meissl numbers, which appears to be narrower for goat-milk fat than for fat from cows' milk (1 : 5 as compared with 1 : 8 to 1 : 9), the Polenske number for goat-milk fat being as a general rule lower than for fat from cows' milk, while the saponification number is higher.

[Gorgonzola cheese], G. CORNALBA (*Coltivatore, 54 (1908), Nos. 40, pp. 426–429; 41, pp. 462–465; 42, pp. 485–490; 43, pp. 519–523; 49, pp. 720–724; 50, 752–755*).—A series of popular articles on the origin, importance, characteristics, and manufacture of Gorgonzola cheese.

[The use of baritine in cheese rind], W. B. CUTTING, Jr. (*Mo. Consular and Trade Rpts. [U. S.], 1908, No. 337, p. 144; Pract. Dairyman, 2 (1908), No. 7, p. 76*).—Baritine, which contains sulphate of barium, is sometimes applied to the rind of Gorgonzola cheese, being used principally on cheese exported during

the summer months. The importation of this cheese into France has recently been prohibited on account of the use of this material. A commission appointed by the Italian ministry of agriculture has reported that sulphate of barium is innocuous because of its insolubility, but also recommends that white clay, powdered talc, brick dust, or some other substitute be used in its stead in order to remove any hindrance with the development of this important export.

The preparation of rennet. S. Marisé (*Rev. Mens. Cám. Merc., 8 (1908), No. 93, pp. 299–303*).—Methods of procuring rennet from plants and animals and its preparation for use in powdered or liquid form is discussed.

Researches on the chemistry of milk and dairying in the first half year 1908. Grimmer (*Milchw. Zentbl., 4 (1908), No. 8, pp. 337–351*).—A review of literature, mostly German, on this subject.

Report on the progress of agrotechnic industries for the years 1904 and 1905. G. Bode (*Chem. Indus. [Berlin], 30 (1907), Nos. 23, pp. 631–637; 24, pp. 674–682; abs. in Vrtljschr. Bayer. Landw. Rat., 13 (1908), No. 2, Sup., pp. 269–278*).—A review of the scientific literature on storing grain, milling, and baking, the utilization of potatoes, and the manufacture of sugar and starch.

Annual report on the investigations and progress in the manufacture of sugar. J. Bock (*Jahresber. Zuckerfabrik. [Stammer], 47 (1907), pp. X+342, figs. 12*).—A review of the literature of all branches of sugar making for 1906, from the culture and growth of sugar-yielding plants to technical and chemical investigations of sugar products. There are also given descriptions of patents, tables of statistics, and texts of laws which concern the sugar industry of different countries.

The sugar industry: Its raw material, preparation, and its industrial significance. T. Grotewold (*Die Zuckerindustrie: Ihr Rohmaterial, ihre Technik und ihre Volkswirtschaftliche Bedeutung. Stuttgart [1907], pp. 176, figs. 43*).—A general treatise on this topic.

Metals in contact with wine. G. Bertoni (*Gior. Vin. Ital., 34 (1908), No. 46, pp. 726–729*).—A red wine was kept for several weeks in a vessel made of tin plate holding 25 liters. At the end of that time the wine which had deteriorated in quality was analyzed and found to contain 10 per cent alcohol, 26.6 per cent nitrogen-free extract, 4.90 per cent total acids, 0.577 per cent volatile acids, 1.62 per cent cream of tartar, 1.10 per cent tannin, and 2.294 per cent ash. The same kind of wine kept in glass analyzed as follows: Alcohol 10 per cent, nitrogen-free extract 27.4 per cent, total acids 5.55 per cent, volatile acids 0.72 per cent, cream of tartar 1.82 per cent, tannin 1.22 per cent, and ash 2.32 per cent.

VETERINARY MEDICINE.

Three diseases of animals which have recently assumed importance to the State sanitarian. J. R. Mohler (*Amer. Vet. Rev., 34 (1908), No. 2, pp. 198–208*).—Infectious anemia, mycotic lymphangitis, and chronic bacterial dysentery have recently been found to have a greater distribution in this country than has heretofore been known.

Infectious anemia, known also as swamp fever, and by several other names, has recently been investigated. An ultramicroscopic organism has been definitely determined as the cause of the disease. Formerly supposed to be confined to Manitoba and Minnesota, the disease now appears to be more or less prevalent in Kansas, Nebraska, Colorado, Wyoming, Montana, North Dakota, and Texas. A mortality of 75 per cent or higher has been estimated by veterinarians from sections where the disease is prevalent. Arsenic, quinin, silver, and other preparations have been used without uniform success. Symptomatic treatment appears to be the most dependable.

Mycotic lymphangitis is a chronic contagious disease, particularly of equines, caused by *Saccharomyces farciminosis*, which was first discovered in this country in Pennsylvania in 1907. Its presence has now been definitely established in Ohio, Iowa, California, and North Dakota. There is also a probability of its existence in Indiana and several western States. Treatment consists at the outset of extirpation of the nodules, lymph vessels, and neighboring lymph glands, in case the lesions are localized. Isolation of the animal and disinfection of the stable are necessary.

Chronic bacterial dysentery is due to an acid-fast bacillus simulating the tubercle bacillus. This disease has been reported in Pennyslvania, Minnesota, and Virginia. The infected animal should be isolated and the feces therefrom placed on cultivated soil where healthy cattle will not be exposed to the bacillus. The administration of medicine has been found unsatisfactory. Nutritious dry feed should be fed the diseased animals.

Report of the cattle bureau, A. PETERS (*Agr. of Mass., 1907, pp. 193–263*).—During the year under report there was an increase in the number of outbreaks of rabies and glanders. There were also several outbreaks of symptomatic anthrax or blackleg in young cattle and cases of actinomycosis in cows, verminous bronchitis in sheep, and calf dysentery. An account is given of these diseases and of the work with bovine tuberculosis.

Report of State veterinarian, D. F. LUCKEY (*Ann. Rpt. Mo. Bd. Agr., 40 (1907), pp. 41–55*).—The author reports that 25 shipments of sheep affected with scabies were made from the State during the year. Cattle ticks were found on stock in 5 counties. Of glanders 117 cases are recorded. The loss from hog cholera in Missouri for the past 5 years is estimated as at least $8,000,000. Of 702 head of cattle tested with tuberculin 4.5 per cent were found to be affected with tuberculosis.

Veterinary notes, T. W. CAVE (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 361–373*).—A report is given of experiments made in an attempt to immunize sheep against the disease commonly known as "struck" by the use of vaccines prepared for the protection of cattle against black quarter. It is the author's opinion that the bacilli producing these diseases are closely allied if not absolutely identical.

Investigations into the causes of outbreaks of disease among cattle and sheep have shown that *Strongylus ostertagi* and *S. cervicornis* infested the fourth stomach in enormous numbers and that they are responsible for the emaciation and extreme debility which occurred. It is stated that this is the first record of *S. ostertagi* having been found in Great Britain. Attention is called to the fact that in gid or pothery of lambs, severe loss may be experienced at the time of the invasion of the brain by the parasites and before the well-known hydatids have developed. The importance of destroying the heads of all pothery lambs is emphasized. A case of anthrax in a cow which was undergoing the tuberculin test is recorded.

Annual report on the civil veterinary department, United Provinces, for the year ending March 31, 1907, H. M. MAXWELL (*Ann. Rpt. Civ. Vet. Dept. United Prov., 1907 pp. 17*).—The work of the department is reported under the headings of veterinary instruction, treatment of disease, breeding operations, etc. According to reports received more deaths took place from contagious diseases than during the previous year, namely 4,477, as compared with 3,624. Brief accounts are given of the occurrence of glanders, dourine, surra, anthrax, rinderpest, foot-and-mouth disease, hemorrhagic septicemia, black quarter, and other contagious diseases, and of preventive inoculation.

Annual report of the Punjab veterinary college and civil veterinary department, Punjab, for the year 1907–8, W. RENOUF (*Ann. Rpt. Punjab*

Vet. Col. and Cir. Vet. Dept., 1907–8, pp. III+13+XIII).—Part 1 of this report is devoted to veterinary inspection, part 2 to the treatment of disease, and part 3 to breeding operations. Among the diseases mentioned as having occurred during the year are glanders, surra, rinderpest, hemorrhagic septicemia, foot-and-mouth disease, black quarter, anthrax, and rabies. Tables are appended showing the number of deaths from contagious diseases, results of preventive inoculations, number of animals treated, etc.

Report of the civil veterinary department, Eastern Bengal and Assam, for the year 1907–8. W. HARRIS ET AL. (*Rpt. Cir. Vet. Dept., East. Bengal and Assam, 1907–8, pp. 2+17+2*).—The work of the year is reported under the headings of veterinary instruction, treatment of disease, preventive inoculation, breeding operations, etc. Among the diseases reported are glanders, anthrax, surra, rinderpest, foot-and-mouth disease, hemorrhagic septicemia, and black quarter. The deaths from contagious diseases, results from preventive inoculation, number of animals treated, etc., are arranged in tabular form.

Report of the principal veterinary surgeon, C. E. GRAY (*Transvaal Dept. Agr. Ann. Rpt., 1906–7, pp. 70–84, map 1*).—During the 12 months under report East Coast fever, lung sickness, ulcerative lymphangitis, mange, and glanders decreased, while scab and swine fever increased in prevalence. A system of inspection of all dairy cows kept within municipal areas is recommended.

Report of the government veterinary bacteriologist, A. THEILER (*Transvaal Dept. Agr. Ann. Rpt., 1906–7, pp. 87–131*).—From inoculation and tick experiments it has been determined that *Piroplasma mutans* does not belong to the life cycle of *P. bigeminum* and that while the blue tick (*Rhipicephalus decoloratus*) carries *P. bigeminum* it does not carry *P. mutans*. Experiments with English redwater, which is probably due to *P. boris* of Europe, and South African redwater due to *P. bigeminum* are reviewed, from which it appears that the diseases are distinct. Further experiments with many variations were performed in the attempt to transmit East Coast fever by means other than through the medium of ticks. As these all failed there appears to be no way of artificially immunizing animals.

The Tzaneen virus used in the inoculation of mules against horse sickness, for some unaccountable reason became inert during the year and the ordinary strain was resorted to. Since 1905, 8,766 mules have been inoculated with a mortality of 329 or 3.7 per cent. From statistics at hand it is estimated that during the last season 6,783 horses and noninoculated mules died. Further investigations of horse sickness are reported.

Experiments made show that equines can be inoculated against piroplasmosis with a small risk of mortality providing certain precautions are observed. Virus obtained from the eleventh to eighteenth generations has been used successfully in inoculating against blue tongue in sheep. It is stated that the farmers are unanimous in testifying to the efficacy of this vaccine.

A disease of sheep known as gonw-ziekte which had appeared at repeated intervals from 1904 to 1906 was investigated and is believed to be a specific disease. A disease known as stiff sickness or the 3-days' sickness attacked cattle in several localities but was of ephemeral nature and did not cause serious damage. There was an unusual increase of *Strongylus contortus* in many parts of the Transvaal. Besides these wireworms, *Œsophagostoma columbianum* were present to a large extent. A detailed report is given of microscopic and anatomical examinations.

Animal diseases, TUCKER (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1907–8, pp. 14–18*).—A brief account is given of the diseases occurring during the year in sheep, calves, and young stock, adult cattle, horses, and pigs. Redwater

is reported to have spread during the year into uninfected territory, a heavy mortality resulting, small dairymen in some cases losing their entire herds. Small outbreaks of pleuro-pneumonia occurred throughout the state. The animal returns for the year show 4.6 per cent of the cows and 5.2 per cent of the pigs slaughtered to have been wholly or partially condemned for tuberculosis. Actinomycosis is said to be a very common disease and contagious abortion is becoming more evident in the dairying districts.

Common dangerous communicable diseases of domestic animals in the Philippine Islands, D. G. MOBERLY (*Philippine Agr. Rev. [English Ed.], 1 (1908), No. 3, pp. 110–135*).—Information is given in the form of questions and answers on rinderpest, surra, foot-and-mouth disease, anthrax, hog cholera, glanders, hemorrhagic septicemia, and ulcerative lymphangitis, with methods for disinfecting.

The influence of symbiosis upon the pathogenicity of micro-organisms, W. E. MUSGRAVE (*Philippine Jour. Sci., B, Med. Sci., 3 (1908), No. 2, pp. 77–88*).—Bacterial and animal symbiosis are discussed at length by the author. Many of the phenomena not now understood in the etiology and pathology of disease are said to be due to symbiotic combinations between micro-organisms. Variability in the virulence of bacteria is one of the most marked features and the reason for this variability is but partially understood. The author concludes that "the most promising field for laboratory research in the future will be the study of cause and effect, in the complex relations in which they occur in nature, of the interrelation and interaction of micro-organisms with each other and in their environment of complex symbiosis and the ever changing and multiple conditions found in hosts."

Protozoa and disease, J. J. CLARKE (*London, 1908, pt. 2, pp. XII+138, figs. 53*).—Attention is called to the great advance in our knowledge of the Sporozoa since the appearance of part 1 of this treatise (E. S. R., 15, p. 405). The causes and nature of several diseases of man make up the main part of this volume. The life histories of both nonparasitic and parasitic protozoa are followed by notes on tropical diseases, ticks, and piroplasmosis. In the concluding chapter the author considers the infective genital tumors of dogs.

The prevalence and distribution of the animal parasites of man in the Philippine Islands, with a consideration of their possible influence upon the public health, P. E. GARRISON (*Philippine Jour. Soc., B, Med. Sci., 3 (1908), No. 3, pp. 191–209*).—The results of examinations of feces of prisoners at Bilibid prison made in 1907, show the population of the islands to be almost universally infested with animal parasites. Of 4,106 prisoners examined, 3,447, or 84 per cent, were found to be infested. No particular part of the islands appeared to be subject to any excess of infection. The results are summarized as follows:

Prevalence of animal parasites in the feces of 4,106 prisoners in the Philippine Islands.

Kind of parasite.	Number of prisoners infected.	Per cent infected.	Kind of parasite.	Number of prisoners infected.	Per cent infected.
Whipworms (Trichuris)	2,426	59	"Japanese blood flukes" (Schistosoma)	16	0.4
Hookworms	2,135	52	"Japanese liver flukes" (Opisthorchis)	11	.3
Eelworms (Ascaris)	1,052	26	The "dwarf tapeworm" (Hymenolepis)	5	.1
Amœba	926	23			
Other intestinal protozoa (ciliates and flagellates)	853	21	Total infestations	7,636	
"Cochin China diarrhea worms" (Strongyloides)	132	3	Intestinal worms only	5,812	
Pinworms (Oxyuris)	32	.8	Flukes	45	1.1
Tænia	30	.7	All intestinal protozoa	1,779	43
"Japanese lung flukes" (Paragonimus)	18	.4			

The spirochetes and their relationship to other organisms, H. B. Ward (*Amer. Nat., 42 (1908), No. 498, pp. 374–387*).—A general account of spirochetes and their relation to other spiral micro-organisms is here given. Fifteen species are recognized as belonging to the genus Spirochæta.

The life history of Trypanosoma equiperdum, J. E. S. Moore and A. Breinl (*Proc. Roy. Soc. [London], Ser. B 80 (1908), No. B 540, pp. 288–298, pls. 2, figs. 2, dgm. 1*).—When *Trypanosoma equiperdum* is injected into rats the parasites multiply and kill the animal about 4 days after their first appearance in the blood, which occurs about 3 days after inoculation. A large number of slides were prepared at short intervals from the appearance of the trypanosomes up to death and for a short time afterwards. The results of prolonged investigations indicate that the transference takes place by means of the ordinary trypanosome encountered in the blood, possibly through the existence of slight abrasions on the animals that become infected, or more probably through the capacity of the trypanosomes to invade a mucous membrane even if it is intact.

The authors conclude that "during the infection of rats with dourine, that is to say, with a form of trypanosome which under normal circumstances is not related to two distinct hosts, there exists a life cycle among the parasites closely analogous to that occurring during the successive positive and negative periods of infection of the same animals with *T. gambiense*.

"The parasites, after introduction into a rat, multiply by longitudinal fission, accompanied by amitotic division of the nucleus. After this process an interaction takes place between the extra-nuclear centrosome and the nucleus (sexual stage?). Division again proceeds, and finally the trypanosomes are converted into round bodies, which correspond to the latent bodies of *T. gambiense*, but possess two long and delicate flagella."

The fixation, multiplication, and culture of pathogenic trypanosomes in the proboscis of tsetse flies, E. Roubaud (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 8, pp. 423–425*).—Experiments were conducted in which *Glossina palpalis* was fed upon animals infected with *Trypanosoma gambiense*, *T. dimorphon*, *T. brucei*, and *T. cazalboui*. It was found that immediately after this fly had fed upon the blood of an infected animal its proboscis contained blood in which trypanosomes were moving actively. In a short time the trypanosomes attached themselves to the wall of the proboscis and underwent changes of structure that were completed in about 5 minutes after ingestion of the blood. While conjugation was not observed the parasites multiplied actively. It is shown that the forms in the proboscis are not derived from trypanosomes regugitated from the digestive tract of the fly. The culture in the proboscis persisted for 48 hours in *T. brucei* and for 5 or 6 days in the other 3 species. Only about 10 per cent, however, of the flies that fed on infected animals developed a culture of the trypanosomes in the proboscis.

Histological observations on sleeping sickness and other trypanosome infections, F. W. Mott (*Rpts. Sleeping Sickness Com. Roy. Soc. 1906, No. 7, pp. 45, pls. 11*).—In addition to cases of *Trypanosoma gambiense* infection, the brains of 2 oxen with Jinga trypanosome and of a rabbit infected with surra were studied, the results of which are here given. A bibliographical list is appended.

Atoxyl and trypanosomiasis, R. Boyce and A. Breinl (*Ann. Trop. Med. and Par., 2 (1908), No. 1, pp. 1–32*).—The use of arsenic and its compounds, and the results of treatment with these and allied drugs is here reviewed.

Literary references—Trypanosomiasis and sleeping sickness (*Jour. Trop. Med. and Hyg. [London], 11 (1908), Nos. 9, pp. 146, 147; 10, p. 162; 11, pp. 179, 180; 12, p. 196*).—These references include literature issued during the year 1907.

Literary references—Plague (*Jour. Trop. Med. and Hyg.* [*London*], *11* (*1908*), *Nos. 7, p. 116; 8, pp. 130, 131*).—References to the literature issued during 1907 on plague are here given. Many of these give data upon rats and fleas.

The cause and prevention of the spread of plague in India, W. G. Liston (*Bombay Sanit. Assoc., 1907, Dec. 11, pp. 38, figs. 24; abs. in Bul. Inst. Pasteur, 6* (*1908*), *No. 11, p. 487*).—Included in this account are descriptions of different species of rats and fleas occurring in India. The author considers *Mus rattus* and *Pulex cheopis* as the species particularly concerned in the transmission of plague in India.

Report on experiments undertaken to discover whether the common domestic animals of India are affected by plague, W. B. Bannerman and R. J. Kápadía (*Jour. Hyg.* [*Cambridge*], *8* (*1908*), *No. 2, pp. 209–220*).—The experiments conducted appear to show that pigs, calves, fowls, turkeys, geese, and ducks are immune to the plague.

Filtration experiments with virus of cattle plague, E. H. Ruediger (*Philippine Jour. Sci., B, Med. Sci., 3* (*1908*), *No. 2, pp. 165–169, charts 25*).—The causative agent of cattle plague present in the bile and in the blood of an animal suffering with the disease apparently does not pass through the pores of Berkefeld filters marked V, N, or W. Physiological salt solution injected into the peritoneal cavity of an animal suffering from cattle plague and collected 1 or 2 hours later, appears to be infectious after having been passed through any one of these three Berkefeld filters. The peritoneal fluid thus prepared accordingly appears to be fully as virulent as the blood of the animal.

Recurrent fever in South Oran and Pediculus vestimenti, E. Sergent and H. Foley (*Bul. Soc. Path. Exot., 1* (*1908*), *pp. 174–176; abs. in Bul. Inst. Pasteur, 6* (*1908*), *No. 12, p. 553*).—The authors investigated an epidemic of recurrent fever in the natives of the Moroccan frontier from which it was concluded that *Argas persicus* and *P. vestimenti* are the species probably concerned in the transmission of the disease. Arthropods that had sucked blood from individuals sick with the disease were sent to Paris where they were ground in water and injected into monkeys. One monkey injected with the ground body of a louse was infected, while negative results were obtained from similar injections of 18 bugs and 22 ticks.

Abdominal hernia, O'Connor (*Vet. Rec., 21* (*1908*), *No. 1055, pp. 186–194, figs. 3*).—The etiology, symptoms, diagnosis, prognosis, and treatment of external abdominal hernia are discussed by the author.

The chronic arsenical poisoning of herbivorous animals, W. D. Harkins and R. E. Swain (*Jour. Amer. Chem. Soc., 30* (*1908*), *No. 6, pp. 928–946, fig. 1*).—Studies made in Montana on the effect of smelter smoke upon animals feeding on vegetation in the vicinity of smelters are reported.

While there is comparatively little sickness during the late spring and summer, by November a large number of animals are affected if allowed to run upon the pastures. A case is reported in which large numbers of sheep died after feeding for 1 week in October in a pasture 15 miles north from the smelter. Analyses were made of grass and moss taken from this pasture and in the grass 52 parts and in the moss 405 parts of arsenic trioxid in a million were found.

Autopsies of a large number of animals including horses, cattle, and sheep were made and many of the samples obtained were analyzed and the results of part of these are given in tabular form. It is shown that in one case a cow's liver contained 43 times the maximum amount of arsenic trioxid allowed in the recommendations made by the Royal Commission on Arsenical Poisoning. Flesh and also milk were found which likewise exceeded the limit prescribed by this commission.

Considerable data are given on the physiological action of arsenic. Experiments with sheep show that 46 mg. (0.7 grain) of arsenic trioxid per day, administered in the form of sodium arsenite per 100 lbs. of body weight is sufficient to cause the death of a sheep. Digestion experiments made to determine the amount of arsenic in plants that is soluble in the digestive juices of animals are reported. A detailed account is given showing the distribution of arsenic in the tissues, the milk, ulcers of the nose, and in the hair. Symptoms of the chronic arsenical poisoning caused by the vegetation of smelter regions are described.

A list of plants poisonous to stock, S. T. PARKINSON and E. J. RUSSELL (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 347–359*).—A table of the common wild plants found in Great Britain that are poisonous to stock is given. This includes common and botanical names, habitat, poisonous properties, and, when known, the chemical substances present.

The foot-and-mouth situation, L. PEARSON (*Nat. Stockman and Farmer, 32 (1908), No. 37, p. 876*).—Extracts from a letter in which an account of the work of eradication of this disease in Pennsylvania is described. Up to December 7, 94 infected herds had been found in the State. It is stated that all of the infection in Pennsylvania traces to Buffalo from which at least 9 infected carloads were sent into different localities about November 1.

Johne's disease in cattle, W. L. BEEBE (*Amer. Vet. Rev., 33 (1908), No. 6, pp. 709–716, figs. 3*).—Attention is called to the fact that chronic enteritis exists in the northwest, particularly in Minnesota. An account is given of several cases, of the symptoms, and of a post-mortem examination. The author concludes that there is very little room for doubt that the bacillus found so abundantly and so uniformly present is the cause of the disease, although attempts by the author and others to infect rabbits and guinea pigs have failed as have also attempts to cultivate the bacillus on artificial media. The disease is regarded as infectious and of grave importance. The author recommends that all affected animals be isolated, that the feces be deeply buried or burned, and that after a positive diagnosis has been made all animals be destroyed. References to the literature are given.

Experiments with English and South African redwater, A. THEILER (*Transvaal Agr. Jour., 6 (1908), No. 24, pp. 534–543*).—From experiments conducted with heifers in England and South Africa the author concludes that English redwater is not always inoculable, and that it differs in this respect from South African redwater.

An investigation in County Wexford, of a disease in young cattle, J. H. NORRIS (*Dept. Agr. and Tech. Instr. Ireland Jour., 8 (1908), No. 4, pp. 633, 634*).—This is a final report, previous reports having been noted (E. S. R., 18, p. 778). In these experiments 92 healthy calves were reared on 8 farms without a single loss, by keeping them from the other stock and on clean pasture. These farms in previous years had shown a death rate of 30 per cent.

Measures against animal tuberculosis in Denmark, B. BANG (*Amer. Vet. Rev., 34 (1908), No. 2, pp. 161–185; Jour. Compar. Path. and Ther., 21 (1908), No. 4, pp. 287–303*).—This article forms a report of the Danish International Committee submitted to the International Congress on Tuberculosis, at Washington, 1908. The tuberculosis acts of 1893 and 1904 and the amendment of 1898 are reported and discussed.

The passing of the State act of 1893 was chiefly due to the proposal of the author, who had been studying the efficacy of tuberculin for indicating the existence of tuberculosis among cattle and other domesticated animals, and who had worked out a system for the extermination of the disease in an in-

fected herd. An account is given of the so-called Bang method as carried out in Denmark and previously noted (E. S. R., 9, p. 991; 18, p. 81). In view of American experience, particular importance attaches to the requirement that only milk and buttermilk heated to a temperature of 80° C. can be returned from dairies to serve as food for cattle and pigs, and only such as is proved to have been heated to at least this temperature can be imported.

The blood of the horse, J. Sabrazès, L. Muratet, and P. Durroux (*Compt. Rend. Soc. Biol. [Paris], 65 (1908), No. 26, pp. 169–173; Gaz. Sci. Méd. Bordeaux, 29 (1908), Nos. 28, pp. 325–330; 29, pp. 339, 340*).—These contributions include a review of the literature and the report of investigations made by the authors. Studies were made of the density, corpuscular resistance, coagulation, etc., of blood from a large number of horses. The leucocytes were given particular attention and their variation under varying conditions including the influence of age, effect of digestion, management, fatigue, etc., was determined.

RURAL ENGINEERING.

Highway engineering, C. E. Morrison (*New York, 1908, pp. VI+315, figs. 60*).—This is intended for use as a text-book for the author's classes in Columbia University, and its purpose is stated to be "to emphasize the basic principles which are essential to good highways." The first chapter is devoted to an analysis of road resistance and the results of tests to determine it. There is about an equal amount of space devoted to country roads and city streets. Specifications form a considerable part of the text, those of New Jersey being given for country roads, those recommended by the National Paving Brick Manufacturers' Association for brick pavements, and those of the City of New York for other city pavements.

A new system of road making (*Surveyor, 35 (1909), No. 885, p. 12, figs. 3*).—A new system which has just been introduced in England is described. This comprises a concave subgrade of broken stone and a convex surface having a metal track for automobiles and traction engines laid in the center of the waterproof road material, and the sides of the road being paved with macadam for ordinary traffic. It is claimed that the advantages gained from its long life will offset the initial high cost of construction.

Effect of traction engine and heavy motor traffic upon road foundations, R. J. Thomas (*Surveyor, 34 (1908), No. 878, pp. 499–501*).—This is one of the papers presented to the First International Road Congress at Paris.

The author's observations on English country roads show that there is a concave cross section of the subsoil wherever the road has been subjected to heavy motor traffic. It is pointed out that the crossbars on the driving wheels are largely responsible for this condition, because of concentrating the weight on a small area with a consequent large unit pressure on the foundation. Concentration of traffic along the center of the road is also a serious factor in injuring the roadbed, largely because the weight of the engine is transmitted to the road by the inner edge of the broad tire when the surface is crowned.

Denatured alcohol in France, F. H. Mason (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3343, pp. 1, 2*).—This article contains statistics of the total production, the sources of distillation, and the various uses to which the supply of denatured alcohol has been put in France. It is noted that there is a large increase in consumption, due to its use for heating and lighting and for the manufacture of ether and explosives. In spite of this increase it is reported that the use of alcohol for motors has not attained its anticipated importance because of the high cost of denaturing material, the tendency to corrode the interior of cylinders, and the failure to explode with sufficient rapidity for automobile purposes.

RURAL ECONOMICS.

[Papers on rural economy]. R. Żeleński et al. (*S. Internat. Landw. Kong. Wien. 1 (1907), pp. 183–211, 322–333, 654–661; 2 (1907), Sec. I, Refs. 1–7, pp. 156; Sec. III, D, Refs. 1–6, pp. 168; summarized in Ann. Sci. Agron., 3. ser., 3 (1908), I, pp. 11–30*).—This is a report of the proceedings of the Eighth International Congress of Agriculture held at Vienna, May 21–25, 1907.

The papers are printed in full in Volume 2, and the topics discussed were: (1) The international regulation of dealing in futures; (2) the union of the International Congress of Agriculture with the International Institute of Agriculture at Rome; (3) the conservation of the agricultural class; (4) a comparative study of duties on agricultural produce; (5) the international labor problem with particular reference to agricultural laborers; (6) the reduction of taxes on land; (7) circulating capital in the agricultural industry; (8) the influence of farm management on net income; (9) book-keeping by an agricultural central organization; (10) the value of nonmarketable agricultural products; (11) the agricultural labor problem, etc.

Mother earth: A proposal for the permanent reconstruction of our country life. M. Fordham (*London, 1908, pp. 157*).—The author outlines a scheme for the rehabilitation of agriculture and rural social life in England as a remedy for rural depopulation and the unemployed in cities.

The administration of the small holdings act (*Bd. Agr. and Fisheries [London], Leaflet 216, pp. 8*).—The regulations issued by the Board of Agriculture and Fisheries for the acquisition, assignment, and control of land for small holdings under the acts of 1892 and 1907 are presented in this pamphlet.

Small holdings in England. F. Impey (*Rev. Econ. Internat., 5 (1908), IV, No. 8, pp. 519–548*).—A brief history of the modern small holdings movement in England, with a discussion of the chief provisions of the small holdings and allotments act of 1907 and the economic and social progress made since its operation.

Small holdings in Southwest Lancashire. J. O. Peet (*Jour. Bd. Agr. [London], 15 (1908), No. 8, pp. 561–567*).—A description of the size, operation, and returns of small holdings in Lancashire is presented. The size of the holdings range from about 6 to 40 acres, the latter being quite common, and rents range from £3 10s. to £5 per acre. While the rate of wages paid farm hands ranges from 18s. to 24s. per week, it is seldom that the laborers become small holders "though, with thrifty habits and high wages, they have a good chance of doing so if they desire."

In behalf of small proprietors. J. Aguet (*Coltivatore, 54 (1908), No. 46, pp. 609–612*).—This is an argument in favor of reducing the legal fees and government taxes on land transfers in Italy, with the view of enabling peasants to become the owners of small holdings. Relative to acquiring a piece of land under present conditions statistics are presented to show that the fees and taxes to effect the transfer amount to about one-third or even as high as one-half the purchase price, and this is regarded as too burdensome on the farm laboring class.

The sale of lands to peasants [in Russia] (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 10, pp. 1262–1271*).—This is a summary of the work of the agricultural commission during the year ended October 1, 1907, previously noted from another source (E. S. R., 20, p. 91).

The agrarian question in Bosnia. A. Raffalovich (*Econ. Européen, 34 (1908), No. 880, pp. 649, 650*).—Notes are given on the population, number and class of holdings, and land-tenure system in Bosnia, with a comparison of the

condition of the peasant class under the Turkish and Austrian régimes. The burdens on the agricultural class are regarded as the cause of the constant agitation in the province.

The economic relations of twenty-two farms near Offenburg, Baden, F. Bornemann (*Arb. Deut. Landw. Gesell., 1908, No. 148, Art. 13, pp. 41*).—The economic relations of these farms, including system of management, acreage and kind of crops, live stock, amount and kind of labor, use of machinery, financial returns, etc., are tabulated and discussed in this article.

The progressive farmer, T. P. Gill (*Irish Farming World, 21 (1908), No. 1081, pp. 1148, 1149*).—A discussion of agricultural conditions in Ireland and a presentation of facts regarding the farmer's need of studying markets and carrying on scientific agriculture with a view of improving his economic condition. The need of raising first-class products in competition with foreign trade is urged upon Irish farmers, and greater cooperation among farmers is advocated as a means toward greater economic and social development.

Cooperation for small holders, E. J. Cheney (*Jour. Bd. Agr. [London], 15 (1908), No. 8, pp. 579–585*).—The economic advantages of cooperation to small holders in England are discussed in this article, with suggestions as to the different lines along which the cooperative movement should be developed.

Annual report of the Agricultural Organization Society for the year ended December 31, 1907, R. A. Yerburgh and J. N. Harris (*Ann. Rpt. Agr. Organ. Soc. [London], 1907, pp. 86, dgm. 1, map 1*).—An account of the development of agricultural cooperation in Great Britain during 1907. The societies numbered 167, the membership 10,500, and the total business about £610,000. The purposes of this organization have already been noted (E. S. R., 18, p. 786).

Development of agricultural cooperative societies (*Bul. Mens. Off. Renscig. Agr. [Paris], 7 (1908), No. 10, pp. 1287–1289*).—On January 1, 1908, the cooperative dairies in Denmark numbered 1,101, with 160,000 members, the slaughterhouses 36, with 95,000 members, and the egg-collecting associations 792, with 58,140 members. See also a previous note (E. S. R., 19, p. 992).

Associations for the purchase of agricultural machines, M. Bérillon (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 46, pp. 593–597*).—The author shows by statistics that more than half the land under cultivation in France is in small and moderate-size farms ranging from 2½ to 100 acres. The number and size of farms are as follows: From 2½ to 25 acres, 2,630,000 holdings; from 25 to 100 acres, 730,000 holdings; and above 100 acres in size 142,000 holdings.

The author presents a scheme whereby the owners and tenants on small farms can by forming cooperative associations procure modern machinery for exploiting their holdings. The effect of cooperation of this nature it is believed would be to improve the moral and economic welfare of small proprietors and bring about agricultural prosperity in France.

Agricultural credit in Belgium in 1906–7, Gilliéron-Duboux (*Chron. Agr. Vaud, 21 (1908), No. 22, pp. 465–470*).—Notes on the development of agricultural credit institutions in Belgium, the methods of procuring loans, the number and value of loans granted, and the number and location of the credit banks. On January 1, 1908, there were 7 central banks with 540 affiliated rural credit associations.

Agricultural legislation [in Portugal], compiled by A. G. Ramalho (*Legislação Agricola. Lisbon: Govt., 1907, Vol. II, No. 1, pp. 186*).—A chronological compilation of Portuguese laws, decrees, and other official documents of interest to agriculture from 1385 to 1446.

AGRICULTURAL EDUCATION.

Instruction in agriculture and forestry (*Ann. Sci. Agron., 3. ser., 3 (1908), I, pp. 31–72*).—Abstracts are given of the following addresses presented at the Eighth International Congress of Agriculture in Vienna in 1907: The More Practical Organization of Higher Agricultural Instruction, by H. Thiel; reports concerning The Supply and Demand of Specialists in the Promotion of Agriculture and Forestry, by V. Egger-Möllwald and Boettger; Is there Legal Authority for Demanding a Certificate of Proficiency from Directors of Agricultural and Forestry Enterprises, by H. de Haerdtl, R. von Guttenberg, and von Jaroschka; Experimental Work in Secondary Schools as a Method and Subject of Instruction, by F. Schindler; The Development of Agricultural and Forestry Instruction in Primary and Secondary Schools, by Rudolf Jugoviz; Instruction in Agriculture and Domestic Science, by P. de Vuyst; Agricultural Instruction for Soldiers, by Nazzari; How Chile Saltpeter May be Replaced in the Future, by A. Frank and K. Birkeland; What is the Best Organization of Agricultural Research, by A. C. True, Thomas Kosutány, and F. W. Dafert (E. S. R., 18, p. 1098); On the Effectiveness of Demonstration Trials in Pots or in the Field, by O. Reitmair; Statistics and Charts on Peat, by W. Bersch; and New Practice in Moor Culture, by B. Tacke.

Seventh annual general report of the Department of Agriculture and Technical Instruction for Ireland (*Dept. Agr. and Tech. Instr. Ireland, Ann. Gen. Rpt., 7 (1906–7), pp. VI+658*).—Along with administrative matters this report contains details of the department's work in agriculture, including agricultural instruction, and in technical instruction, including domestic science.

Under agricultural instruction an account is given of itinerant instruction and special courses, and of the instruction given at the Royal College of Science, Cirencester; Albert Agricultural College, Glasnevin; agricultural stations, agricultural classes and schools, Munster Institute, Cork; Ulster Dairy School, Loughry; and schools of rural domestic economy. The report on technical instruction includes the organization of a system of instruction in experimental science, drawing, manual instruction and domestic economy in day secondary schools, the organization of technical instruction under local authorities, the training of teachers in domestic economy, and the work of the Irish Training School of Domestic Economy and the Killarney School of Housewifery.

The appendixes include a table showing the 1907 apportionment of funds for educational and other purposes, schemes of instruction in agricultural subjects, prospectuses of agricultural colleges and stations and schools of rural economy, program of experimental science, drawing, and domestic economy for day secondary schools, programs of the institutions under the direct control of the department, examples of schemes of technical instruction in nonagricultural subjects, including domestic science, list of day secondary schools, showing grants paid for instruction in the subjects of the department's program during 1905–6, a list of home industries classes in receipt of aid during 1906–7, and a list of science, art, and technical schools and classes working in connection with the department or under local schemes.

[Agricultural and forestry instruction in Austria and Germany] (*Land u. Forstw. Unterrichts Ztg., 21 (1907), No. 3–4, pp. 175–307*).—This number is devoted to (1) the following special articles: Observations on Forestry Instruction, by A. Cieslar; The Development and Problems of Analytical Chemistry, by G. Vortmann; Observations on Methods of Instruction in Secondary Agricultural Schools, by A. Kullisz; and Itinerant Cooking and Housekeeping Courses for the Farming Community of Upper Austria; (2) present status and

organization of agricultural and forestry institutions in Prussia; (3) review of agricultural literature and book notices; and (4) notes from the annual reports of the agricultural and forestry schools for 1906–7.

[Agricultural and forestry education in Austria] (*Land u. Forstw. Unterrichts Ztg., 21 (1907), No. 1–2, pp. 174+LV*).—This report contains (1) special articles as follows: The Importance of Vocational Schools, by L. Fleischer; Vocational Instruction at the Eighth International Congress in Vienna, by E. Vital; Observations on Forestry Instruction, by A. Cieslar; and Suggestions For and Examples of Practical Experimental Work by Agricultural Schools, by F. Schindler; (2) statistical tables including date of organization, length of courses, number in faculties, attendance, graduates, occupations of 1906 graduates, stipends and special courses, of the agricultural and forestry institutions in Austria, and their geographical distribution; (3) Statistical Contributions to the History of Agricultural and Forestry Instruction: The Vocational Schools of Austria in 1903–4, by E. Vital; and (4) review of agricultural literature and book notices.

It is shown that in 1906–7 there were 195 agricultural and forestry schools in Austria, an increase of 6 over 1905–6. They included 3 high-school institutes, 3 agricultural academies, 9 agricultural high schools, 5 forestry high schools, 2 high schools for viticulture, fruit culture, and horticulture, 1 high school for the brewing industry, 43 farm schools or elementary agricultural schools with one-year courses, 75 agricultural winter schools, 10 elementary forestry schools, 17 dairy and housekeeping schools, 23 elementary special schools for horticulture, fruit culture, viticulture, hop culture, alpine farming, and apiculture, 2 brewing and 2 distillery schools.

[Agricultural and forestry instruction in Austria and other countries] (*Land u. Forstw. Unterrichts, Ztg., 22 (1908), No. 1–2, pp. 148+LV*).—This number is devoted to (1) the following special articles: Raising the Scientific Plane of Secondary Agricultural Schools, by A. Kulisz; Fostering a Taste for the Fine Arts in Secondary and Higher Agricultural and Forestry Schools, by J. Longo; and The Question of Text-books for Elementary Agricultural Schools, by H. Knesch; (2) an account of the present status and organization of agricultural and forestry institutions in the Kingdom of Saxony; (3) the organization of agricultural and forestry instruction in Switzerland; (4) itinerant housekeeping schools in France, and the poultry school at Gambais; (5) review of agricultural literature, and book notices; (6) notes from the annual reports of the agricultural and forestry schools for 1906–7; (7) miscellaneous notes; (8) an appendix containing a list of all the agricultural and forestry institutions in Austria and their boards of instruction, and (9) statistical data for 1907–8 of the agricultural and forestry institutions in Austria corresponding to those given for 1906–7 in the preceding abstract. These statistics show a net gain of 5 schools as compared with the previous year. This includes a decrease of 2 farm schools or elementary agricultural schools with one-year courses, and an increase of 5 agricultural winter schools, 1 elementary forestry school, and 1 elementary special school for horticulture, fruit culture, viticulture, hop culture, alpine farming, and apiculture.

Agricultural instruction in Saxony (*Jahresber. Landw. Königr. Sachs., 1907, pp. 83–103*).—This contains brief reports for 1907 of institutions in Saxony giving instruction in agriculture and domestic science, and of special courses in agriculture, together with tables showing the attendance, by provinces, for 1907–8 at the elementary agricultural schools and the total attendance from 1875 to 1908.

School training for the home duties of women. III. The domestic training of girls in Germany and Austria (*Bd. Ed. [London]. Spec. Rpts. Ed. Subjects, 19* (*1907*), *pp. 121+XVI*).—This is the third and concluding number of the special reports on the school training for home duties for women. It includes (1) introductory and concluding articles on the general education of girls, history of domestic training, and extent of domestic training in Germany and Austria; and discusses (2) the teaching of domestic subjects in elementary and continuation schools; (3) the teaching of domestic subjects in secondary schools; (4) domestic subjects in technical schools and classes; and (5) technical teachers in girls' schools. Twelve appendixes contain specimen accounts and lesson plans and extracts of syllabi and courses of study of individual schools, as well as summaries of regulations of several groups of schools.

MISCELLANEOUS.

Annual report of agricultural experiment station at Marburg for 1907–8. C. Haselhoff (*Jahresber. Landw. Vers. Stat. Marburg, 1907–8, pp. 22*).—This gives the organization of the station and an account of its work and publications during the year.

A brief review of the investigations conducted by the Government Agricultural Experiment Station, Groningen, from 1895 to 1907, B. Sjollema (*Kort Overzicht van de Onderzoekingen Verricht in het Rijkslandbouwproefstation te Groningen, in de Jaren 1895–1907. [Groningen]: Gov't., 1907, pp. 19*).

Agricultural report for the year 1906. Y. Henry (*Gouv. Gén. Afrique Occident. Franç., Rap. Agr. 1906, pp. 310, figs. 63, maps 11*).—This report describes the organization of the agricultural service, the experiment stations, and the agricultural resources and possibilities of western French-Africa.

Agricultural writers, 1200 to 1800. D. McDonald (*London, 1908, pp. 228, illus. 97*).—This consists of reproductions in facsimile and extracts from the writings of English agricultural writers from Sir Walter of Henley, 1200, to Arthur Young, 1800, together with brief biographies and explanatory notes. A chronological bibliography is appended.

Batten's agricultural directory (*New York, 1908, pp. 212*).—A directory of the agricultural press of the United States and Canada, with a discussion of agricultural conditions in these countries and statistics of farm products and values by States and Provinces.

Index to the first twenty volumes of bulletin de l'Association des Chimistes de Sucrerie et de Distillerie, L. Pellet (*Association des Chimistes de Sucrerie et de Distillerie. Table des Matières des Vingt Premiers Volumes, 1882–1902. Paris, 1907, pp. 203*).

General Index, Proceedings and Transactions of the Royal Society of Canada, first and second series, 1882–1906 (*Ottawa, Toronto, and London, 1908, pp. 133*).

NOTES.

Arizona Station.—The Territorial assembly has appropriated $13,100 for the station for the ensuing biennium. Of this $4,500 is for the maintenance of the date orchards at Tempe and Yuma, $2,500 for farmers' institutes, $3,100 for publications, and $3,000 for dry farming experiments in two locations to be selected by the station.

F. C. Kelton has been appointed assistant engineer and entered upon his duties January 15.

Connecticut State Station.—A. F. Hawes, station and State forester, has resigned to accept a similar position in Vermont.

Hawaii Federal Station.—D. L. Van Dine has been transferred to the Bureau of Entomology of this Department in connection with its investigations of sugar cane and rice insects.

Idaho University and Station.—A demonstration train similar to that sent out in northern Idaho last summer made an itinerary of about a month through southern Idaho, beginning February 15. The illustrative material comprised dairy apparatus, including a dairy cow and a milking machine; spraying apparatus; charts; exhibits of grains, grasses and agricultural products; and an agricultural library of about 100 volumes, made up in part of station and Department publications.

Indiana Station.—The State appropriation to the station of $25,000 per year was increased by the legislature at its recent session to $75,000 per year. Of this amount $15,000 is to be used for soil and crop improvement, $10,000 for dairying, $5,000 for poultry work, $10,000 for other live stock interests, $5,000 for the investigation of hog cholera and other animal diseases, and $10,000 for horticultural work. The advisory board, which with the director is given the power to determine the specific lines of work to be undertaken in each case, was enlarged to include, in addition to the State Corn Growers', Dairymen's and Live Stock associations, representatives of the State Horticultural Society and the State Poultry Fanciers' Association. Of the remainder of the appropriation, $10,000 is to be available for general expenses and $10,000 for extension work.

Louisiana Stations.—An arrangement has been effected whereby the secretary of the State Crop Pest Commission, Wilmon Newell, will become an active member of the station staff, devoting half his time to entomological investigations under the Adams Act.

Maryland College and Station.—George E. Gage, Ph. D. (Yale), assistant in the Yale biological laboratory, has been appointed assistant biologist in the station to pursue investigations in poultry diseases. Dr. Robert B. Mayo, assistant pathologist of the station, has resigned to engage in hospital work in Mississippi. Dr. Joseph R. Owens, treasurer of the college since 1890, died March 15, at the age of 70 years.

Massachusetts College.—Carroll D. Wright, a trustee of the college since 1906 and eminent for his contributions to statistics and sociology, died at Worcester, February 20, at the age of 68 years. Dr. Wright had been president of Clark

College since its establishment in 1902, a trustee of the Carnegie Institution of Washington, United States Commissioner of Labor from 1885 to 1905, president of the American Association for the Advancement of Science in 1904, and had held many other positions of prominence. He has been succeeded as trustee by Davis R. Dewey.

Montana College and Station.—The college and station have received increased appropriations from the legislature for the ensuing biennium. The college was granted $78,500 for maintenance, an increase of $12,500, and $50,000 for a woman's dormitory. The station received for maintenance $12,500 per year, an increase of $5,000 per year, in addition to a like amount for the maintenance of the substations. For improvements $10,000 was granted for a sheep and steer barn, an addition to the poultry plant, and sheds for young stock, together with $8,000 for the substations. Authority to purchase 160 acres from the college land grant was conferred, and $18,800 was also appropriated for the purchase of two blocks adjoining the college grounds.

The executive board was replaced by a new governing board, consisting of the president of the college and two members to be selected by the State board of education. The powers of the new board are restricted, supervisory control of the finances being vested in the State board of examiners. The change became effective April 15.

The farmers' institute work was also placed in charge of a new board, this consisting of the governor of the State, the president of the college, and the director of the station. The appropriation for farmers' institutes was increased from $7,500 per year to $8,000 per year.

E. T. Tannatt, professor of civil engineering in the college and engineer in the station, and R. W. Fisher, professor of horticulture and horticulturist, have resigned to engage in commercial work, their resignations becoming effective June 30.

North Dakota College.—According to *Breeders' Gazette*, a full collegiate course in veterinary science and surgery has been established.

Rhode Island College and Station.—C. H. Coggeshall, member of the board of managers since the establishment of the college, has been succeeded by Charles W. Estes, of Warren. The board has been reorganized by the election of Thomas G. Mathewson as vice-president, and Robert S. Burlingame as clerk and treasurer.

Vermont University.—The first annual farmers' week ever attempted in Vermont was held March 8–12, with a registration of 160. The program consisted of lectures and demonstrations by several speakers from various parts of New England as well as members of the university faculty.

Washington College and Station.—The State legislature, which has just adjourned, appropriated to the college and station for the ensuing biennium $487,256 for maintenance, general improvement, equipment, and experimental and extension work; $17,500 for farmers' institutes; and $29,600 for the Puyallup Substation.

A fruit demonstration train was operated in the Yakima Valley March 10–12. Demonstrations were given at 11 stops with a total attendance of 4,215. A new feature of this train was a flat car equipped with a model orchard in tubs, a large apple tree, and a power sprayer by means of which complete demonstrations of spraying and pruning were given.

The South African Veterinary Congress.—*The Veterinary Record* of February 20 and 27 contains a report of the first Pan-African Veterinary Congress which convened at Pretoria on January 13. This congress was initiated by the Transvaal Premier, General Botha, but in his absence was opened by the

Attorney-General, Hon. J. de Villiers, who described it as an epoch-making event. Other veterinary conferences have been held in British South Africa, but this is the first that has included delegates from other than British possessions. Representatives were present from Congo, Madagascar, Basutoland, German West Africa, Mozambique, Rhodesia, Natal Swaziland, Cape Colony, Bechuanaland, and the Transvaal, thus including South Africa nearly to the Equator.

Among the important questions considered were the veterinary laws in regard to stock diseases (including East coast fever, glanders, tuberculosis, lung sickness, rabies, epizootic lymphangitis, scab, and trypanosome affections), meat inspection, and veterinary surveys. Many resolutions were formulated to be submitted to the various African governments, and a subcommittee was appointed consisting of representatives of 6 colonies or states for the purpose of suggesting uniform regulations against animal diseases for the whole of Africa. Recommendations were also drafted in regard to veterinary surveys, with a view to protect the colonies from various unknown diseases from the interior. The importance of this conference is especially great, as the many contagious animal diseases have greatly crippled the agriculture of the colonies.

Innes Bequest to Horticultural Instruction and Research.—*The Gardeners' Chronicle* recently gave full details of a bequest made by the late John Innes, which bids fair to prove of lasting benefit to British horticulture. Under the terms of this bequest, a body of trustees is to administer a sum approximating £10,000 a year for the purposes of establishing and maintaining an institution to be known as the "John Innes Horticultural Institution," and which is to have for its object the promotion of horticultural instruction and research. The direct management of the institution, and such other matters as the trustees may determine, devolves upon a council of twelve persons, of whom the three trustees are ex-officio members, and the remainder selected from specified societies and universities in England. The house and a portion of the grounds of Manor Farm, Merton, England, have been bestowed for the purposes of the institution and for the establishment of a horticultural station which is to be efficiently equipped, including the provision of buildings and lecture rooms. The trustees are further empowered to establish and equip similar stations in other parts of the country or assist in such work.

The Gardeners' Chronicle points out the opportunity thus afforded for the development of a horticultural university, in which research and advanced teaching are the primary objects, and deprecates any possibility of the institution's becoming perverted into a school of elementary instruction.

Apicultural Station in Ontario.—A recent number of *Gleanings in Bee Culture* announces that an apicultural station is to be established under government auspices at Jordon, Ontario, where a fruit station is already in operation. The object of the station is stated to be to conduct experiments in the fertilization of flowers by bees, to carry on apicultural investigations, and to provide courses of instruction in apiculture.

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AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Continued.

U. S. Department of Agriculture.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XX. APRIL, 1909. No. 9.

For several years the widespread popular interest in the work of the National Department of Agriculture has been reflected in the extended consideration given by Congress to the act making appropriations for its support. As was pointed out by Chairman Scott of the Committee on Agriculture in presenting to the House of Representatives the bill for the next fiscal year, the act, "although one of the smallest of the great supply bills annually brought before the House, probably attracts more general interest in this Chamber than any other, and its provisions are more closely scrutinized and more carefully discussed. The reason for this is doubtless found in the fact that the activities of the Department are so widely extended and touch in a vital way the interests of so large a proportion of our people."

That this interest was fully maintained is indicated by the general participation in the subsequent debates upon the measure in both the House and the Senate, the discussion being prolonged to such an extent that it was not until March 4, the final day of the session, that the bill, originally reported on January 25, received the signature of the President.

As finally enacted the measure is substantially in the form in which it was submitted by the House committee. It also follows in a general way the corresponding laws of recent years, but it is even more completely a routine measure, inaugurating comparatively little new work and containing practically no matters of general legislation.

An innovation as to the lump-fund appropriations hitherto made to the various bureaus for their general expenses was adopted, under which in most cases these appropriations have been further subdivided by specifying the amount to be expended for each of the principal lines of work. Thus, the Bureau of Entomology, which last year received a lump fund of $158,800 for entomological investigations without further restrictions as to its division among the various projects under way, is by the new law granted in its stead $46,600 for investigations of insects affecting deciduous fruits,

$21,000 for insects affecting cereal and forage plants, $42,000 for insects affecting southern field crops, $12,000 for forest insects, $16,250 for insects affecting truck crops and stored products, $10,000 for bee culture, $16,500 for insects affecting citrus fruits, and $34,050 for other investigations. With a view to providing for exigencies due to unforeseen conditions, however, a provision was also added to the bill under which 10 per cent of the appropriation for the miscellaneous expenses of the work of any bureau is made available interchangeably for expenditure on the objects included within the general expenses of that bureau, "but no more than ten per centum shall be added to any one item of appropriation except in cases of extraordinary emergency, and then only upon the written order of the Secretary of Agriculture."

The total appropriation carried by the new law is $12,995,036. This is an increase of $1,322,930 over the previous act, or approximately 10 per cent. It makes provision for the continuance of nearly all the lines of work now under way, and in many cases their extension to meet the growing demands upon the Department.

The Weather Bureau receives a total appropriation of $1,508,260. This is a reduction of $154,000, which is due principally to the completion of the new buildings for the Mount Weather Observatory and the elimination of all appropriations for other buildings and equipment of new stations. The lines of work are essentially unchanged. The amount assigned to the investigations in climatology and meteorology is $125,000. The salary of the chief of the Bureau was increased from $5,000 to $6,000. An increase of $4,000 was allowed for contingent expenses, and the limit of cost of maintenance of the Bureau printing office was increased from $30,000 to $45,000.

The appropriation of the Bureau of Animal Industry was increased $97,000, making a total of $1,427,860. Among the items authorized are $250,000 for the eradication of the cattle tick in the South; $625,000 for inspection and quarantine work (other than the federal meat inspection, which is now provided for in the permanent law); $149,000 for the work of the Dairy Division; and $43,000 for the work in animal husbandry. For investigations of animal diseases and the maintenance of the Bureau experiment station, $109,000 was provided together with $25,000 for the purchase of additional land. The appropriation of $50,000 made last year for experiments in animal feeding and breeding in cooperation with the State experiment stations was continued, but the language was so altered as to permit independent investigations by the Bureau as well.

The Bureau of Plant Industry received one of the largest increases in the bill, $367,590, making its total $1,709,266. Of this $1,180,796 is for general expenses, which are further itemized to provide for

thirty-two lines of inquiry. Among these may be mentioned $225,000 for demonstration work against the boll weevil, $133,000 for farm-management investigations, and $71,360 for investigations of the methods of growing, packing, and marketing fruits and melons. An allotment of $76,680 was granted for cooperative demonstrations as to the utilization of arid and semiarid regions, and authority was granted to conduct cooperative work in conjuction with the Reclamation Service on its reclaimed lands. Authority to carry on breeding and testing work with fibrous plants suitable for paper making was also conferred, $10,000 being provided for the purpose. This was in addition to the paper-making tests of plants such as were authorized last year, these being continued in the new act as a special appropriation unassigned to any bureau and extended to include similar tests with woods.

The Bureau was given $12,250 for an investigation of the handling, grading, and baling of cotton and the establishment of standards for the different grades in accordance with previous legislation, and $52,440 was granted for similar work with grain. A clause providing for furnishing at cost to interested parties sets of cotton standards was reported by the Senate committee, but eliminated on a point of order, as was also a clause directing the Department, upon the request of grain growers, to grade their grain before shipment.

For the Congressional seed distribution, which was continued on the usual basis, an increase of $60,320 was granted, making a total of $262,320 for the purpose. The appropriation for the introduction of rare and valuable seeds from foreign countries was slightly decreased, and authority was given to expend not to exceed $10,000 of the amount in the testing and distribution of forage crops.

In the case of the Forest Service the act carries an apparent reduction of $84,100 for statutory salaries, but this is due to extensive transfers to the lump fund appropriation as a result of the recent establishment by the Service of six administrative districts or branch offices in the West, to which a considerable proportion of its Washington staff has been transferred. The net increase in the statutory and lump fund appropriations was $750,000, partly on account of this change, but principally to meet the increased use to which the National Forests are being put and the extension of their limits during the past year by some 17,000,000 acres. Authority to advise owners of woodlands as to their care, omitted last year, was restored, but permission was refused to arrange exchanges of private lands lying within forest reserves for stumpage of substantially equal value from the National Forests with a view to their unification. For permanent improvements the appropriation of last year, $600,000, was continued, making the total for the Forest Service $4,646,200, by far the largest carried in the bill.

The Bureau of Biological Survey was granted an increase of $25,420, of which $7,000 is for the maintenance of the Montana Bison Range and other reservations for mammals and birds. Authority was given for the expenditure of the balance remaining from the appropriation of the previous year for the purchase of land for the Montana Bison Range in completing its fencing, constructing sheds and other buildings, and extending its present area of 12,800 acres to 20,000 acres.

The total appropriation for the Office of Experiment Stations, including $720,000 for the experiment stations under the Hatch Act, is $1,069,220, an increase of $34,600. The allotment for statutory salaries was increased $4,640, this including an increase in the salary of the director from $3,500 to $4,000, and the lump fund for general expenses was increased $4,800, making $34,800 available for this purpose. The appropriations for the stations in Alaska, Hawaii, and Porto Rico were each increased $2,000 to correspond with the increase to the State stations under the Adams Act, and the allotment to the Guam Station was increased to $15,000, of which $1,500 was made available for the purchase of land. For the promotion of agricultural education through farmers' institutes and agricultural schools the appropriation of the previous year, $10,000, was continued. The lines of work assigned to the irrigation and drainage investigations remained unaltered, but in consequence of their recent separation as to organization the appropriation was divided, $75,000 being allotted to the irrigation investigations, and $81,160, a net increase of $6,160, to the drainage investigations.

Authority was granted to resume the nutrition investigations of the Office, which were suspended during the transfer to Washington and reconstruction of the respiration calorimeter and accessory apparatus, an appropriation of $10,000 being made to "investigate the nutritive value of agricultural products used for human food, with special suggestions of plans and methods for the more effective utilization of such products for this purpose, with the cooperation of other bureaus of the Department, and to disseminate useful information on this subject."

The work of the remaining bureaus of the Department was provided for substantially as at present. The appropriation for the Bureau of Chemistry was enlarged $53,840 in consequence of the increased business in connection with the enforcement of the federal food and drugs act. The Bureau of Entomology received a net increase of $92,720, of which $50,000 is for the extension of the gipsy and brown-tail moth campaign, making a total of $300,000 for that purpose. There was extended discussion of the soil surveys of the Department, and these were continued on the present basis. The

net appropriations for both the Bureau of Soils and the Bureau of Statistics showed a slight decrease on account of transfers of a portion of their clerical work, the former receiving $232,860 and the latter $220,920. The work of the Office of Public Roads was continued on the present basis, with an increase of $29,070 to meet growing demands. The salary of the director was increased from $2,750 to $3,000.

To provide for the increase in the general business of the Department as a result of that of the several bureaus, additional appropriations were granted of $41,670 for the Office of the Secretary, $14,800 for the Division of Accounts, $26,740 for the Division of Publications (of which $5,000 is for labor-saving machinery for addressing and mailing publications), and $2,240 for the Library. Owing to the completion of the new structure for stable, shop, and storage purposes, for which $25,000 was appropriated in the current act, there is an apparent decrease of $6,200 in the allotment for contingent expenses.

To the sums carried in this appropriation act should be added the appropriation of $460,000 for the Department printing and binding, which is carried in the appropriation act for sundry civil expenses. There are also permanent appropriations of $3,000,000 for the federal meat inspection, and $624,000 for the Adams fund, both of which are administered by the Department, making a grand total of $17,079,036. This is an imposing aggregate, indicating a substantial and gratifying recognition by Congress of the work of the Department and of the great industry it seeks to promote.

The appropriation act contains, as in previous years, a number of clauses specifically providing for cooperation between the Department and the agricultural colleges and experiment stations in a number of different lines of work, as for example, in animal feeding and breeding, and in general in the work of the Bureau of Plant Industry, but specifically in tests of rare and valuable introduced seeds and plants. In this way Congress indicates its recognition of the fact that the interests and purposes of these institutions are to a large extent identical and that they shall as far as practicable be mutually helpful.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

New determination of the mechanical equivalent of heat, V. Crémieu and L. Rispail (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 18, pp. 793–795, fig. 1*).—According to the authors' determinations, the mechanical equivalent of heat is $J = 4.1851 \times 10^7$ ergs with an experimental error of .0027 in the determined value which is less than 1/1500.

On the accumulation of the heat of the sun in various solutions, A. von Kalecsinszky (*Math. u. Naturw. Ber. Ungarn, 21 (1903) [pub. 1907], pp. 1–24*).—Experiments with fresh water, sea water, and other salt solutions are reported, showing that the storage of heat is decidedly influenced by the salts in solution as well as by the surface covering of the solution, as, for example, with fresh water, olive oil, or petroleum.

Investigations on the formation and decomposition of ammonia by silent electrical discharges in a Siemens tube, with especial reference to the validity of the law of mass action, J. H. Davies (*Ztschr. Phys. Chem., 64 (1908), No. 6, pp. 657–685, figs. 6*).—A somewhat detailed study of the effect of varying conditions of temperature, pressure, gas mixture, etc., is reported.

The volumetric composition of ammonia vapor and the atomic weight of nitrogen, P. A. Guye and A. Pintza (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 20, pp. 925–928, fig. 1; Mém. Soc. Phys. et Hist. Nat. Genève, 35 (1908), No. 4, pp. 594–614, pl. 1, figs. 2; abs. in Rev. Sci. [Paris], 5. ser., 10 (1908), No. 22, p. 699*).—The apparatus and methods employed by the authors in the volumetric analysis of ammonia vapor are described, the causes of error are discussed, and determinations are reported which give an atomic weight for nitrogen between 14 and 14.02, thus confirming the value which is now adopted, namely, 14.01. The volumetric method is considered by the authors too indirect as compared with the gravimetric method.

The modifications of the Kjeldahl method for the quantitative determination of nitrogen, J. S. Hepburn (*Jour. Franklin Inst., 166 (1908), No. 2, pp. 81–99; abs. in Chem. Abs., 2 (1908), No. 23, p. 3206*).—A historical review of tests of this method and its modifications, with 39 references to the literature. Determinations of nitrogen in antipyrin using various catalyzers with the sulphuric acid are reported, but in no case was the theoretical percentage obtained.

A modified Hüfner method for the volumetric determination of nitrogen, V. von Cordier (*Ztschr. Analyt. Chem., 47 (1908), No. 11, pp. 682–687, fig. 1; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 553, II, p. 983; Chem. Zentbl., 1908, II, No. 21, p. 1747, fig. 1*).—The method and apparatus (Victor Meyer vapor density apparatus) required are so modified that a larger amount of the material may be conveniently used for the determination, thus insuring more accurate measurement of the gas evolved by the action of the bromin solution. The method as modified is adapted particularly to the analysis of guanidin picrate and similar substances.

Electrolytic determination of nitric acid, O. L. Shinn (*Jour. Amer. Chem. Soc., 30 (1908), No. 9, pp. 1378–1381; abs. in Science, n. ser., 28 (1908), No. 711, pp. 219, 220; Sci. Abs., Sect. A—Phys., 10 (1908), No. 130, p. 608*).—"It was found that by keeping copper in solution, either by the addition of copper sulphate during reduction, or by retarding the speed at which the anode rotates, the nitric acid is completely reduced to ammonia. This may be determined either by distilling or by titrating excess of acid. Results are almost theoretical."

The determination of phosphoric acid as phosphomolybdic acid, P. Christensen (*Tidsskr. Landbr. Planteavl, 15 (1908), No. 3, pp. 454–466; Ztschr. Analyt. Chem., 47 (1908), No. 9–10, pp. 529–545; abs. in Chem. Ztg., 32 (1908), No. 93, Repert., p. 599; Chem. Zentbl., 1908, II, No. 16, p. 1379; Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 895*).—A series of comparative tests of the complete molybdic method with the so-called direct method is reported. In the direct method the phosphoric acid is precipitated in nitric acid solution, freed from silica, with ammonium molybdate, and the precipitate ignited and weighed, the phosphoric acid being calculated by multiplying the weight of the residue after ignition by 0.0394. The relation of the results obtained by the direct method to the theoretical amounts was as 100 to 108. This relation is closer than that obtained in case of the complete method, and in the author's opinion indicates an accuracy which is sufficient for all practical purposes.

Application of the gasometric method to the exact determination of urea, A. Ronchèse (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 10, pp. 444–452*).—A critical summary and discussion of methods.

A method for the determination of ammonia in barnyard manure, R. K. Kristensen (*Tidsskr. Landbr. Planteavl, 15 (1908), No. 1, p. 24; abs. in Chem. Ztg., 32 (1908), No. 93, Repert., p. 599*).—The method described is based upon distillation with a saturated solution of sodium hydroxid in a stream of air.

The volumetric-alkalimetric determination of alkaline earths in fertilizers and soils, O. Foerster (*Landw. Vers. Stat., 69 (1908), No. 3–4, pp. 235–243; abs. in Chem. Ztg., 32 (1908), No. 91, Repert., p. 581; Chem. Zentbl., 1908, II, No. 24, pp. 1894, 1895; Jour. Chem. Soc. [London], 94 (1908), No. 554, II, p. 1072*).—The use of hydrochloric acid for the titration of the basic substances is proposed in place of sulphuric acid commonly recommended. The use of this acid gives as a rule higher, and in the author's opinion, more accurate results. The details of the proposed method of titration are given.

Determination of the combined lime in humus, P. de Mondesir (*Jour. Agr. Prat., n. ser., 16 (1908), No. 44, pp. 554–557*).—This article discusses the importance of the lime combined with humus in soils and describes methods of determining what is termed the lime equivalent of soils. This determination is based upon the amount of calcium carbonate reduced when soils are treated with this substance.

On the determination of carbon dioxid in water, F. Guth (*Gesndhts. Ingen., 31 (1908), No. 17, pp. 737–742*).—Investigations on this subject are reviewed.

Hydrolysis of vignin of the cowpea, T. B. Osborne and F. W. Heyl (*Amer. Jour. Physiol., 22 (1908), No. 3, pp. 362–372*).—The hydrolysis of vignin of the cowpea (*Vigna sinensis*), a globulin which is the principal protein present, gave results "similar to those found for the proteins of other leguminous seeds, e. g., legumin, vicilin, phaseolin, and glycinin. Although these proteins are in many respects much alike, sufficiently positive differences, of one kind or another, exist between them to leave no doubt that each is a distinctly different protein.

"In conducting this hydrolysis, care was taken to keep account of the undetermined substance, in order to get a clearer idea of its approximate amount, and if possible to locate the large loss indicated by the low summation.

"The substances making up the total are stated as the free amino-acids, and, in addition, a small amount of ammonia. The amino-acids are doubtless united in the protein molecule with the elimination of a molecule of water for each molecule of acid, and it is not improbable that the ammonia is combined with one carboxyl group of the dibasic acids."

According to the authors' calculations, at least 30 per cent of the vignin is not accounted for after hydrolysis. "The substance obtained from the unesterified and ether insoluble part of the products of hydrolysis, which was examined for oxyprolin, weighed only 62.6 gm., equal to 12.26 per cent of the vignin. Of this, 7.58 per cent is included in the 20 per cent of unesterified amino acids, leaving only 4.68 per cent for unknown substances. It would seem from these figures that the losses which are practically unavoidable in carrying out these analyses may have a larger share in explaining the deficiency than has been heretofore supposed.

"It does not, however, seem probable that this apparently large deficiency consists to any considerable extent of products of decomposition already known. The amount of the substances that are determined directly, probably nearly represents the quantity in which they are produced by hydrolysis, for the determinations of glutaminic acid can be controlled to a certain extent by the results obtained by the ester method, and those of arginin, histidin, and lysin are, as will later be shown, accurately controlled by the nitrogen precipitated by phosphotungstic acid. The ammonia determinations are accurate.

"The known protein decomposition products which were not determined in this analysis can not be relied on to account for this difference."

An improvement in the technique in the hydrolysis of protein. The employment of hydrofluoric acid and its advantages, L. Hugounenq and A. Morel (*Journ. Pharm. et Chim., 6. ser., 28 (1908), No. 11, pp. 486–493*).—According to the authors, hydrofluoric acid possesses a number of advantages as a hydrolyzing agent. A smaller quantity of humic substance is produced than is the case with sulphuric or hydrochloric acid and the cleavage of protein to ammonia is smaller.

Concerning the identification of sugars, J. J. Blanksma and W. A. Van Ekenstein (*Chem. Weekbl., 5 (1908), No. 42, pp. 777–781*).—A summary and discussion of methods for the identification of sugars of different sorts.

Identification of δ-fructose in the presence of other natural sugars, J. Pieraerts (*Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 18–19, pp. 966–984*).—A critical study of methods.

The rapid determination of sugar in scum, H. Pellet (*Betterave, 18 (1908), No. 465, pp. 402–404*).—The author describes a method which he has found satisfactory for use in beet-sugar factories.

The Fieh reaction for invert sugar in honey, Drawe (*Ztschr. Öffentl. Chem., 14 (1908), No. 18, p. 352*).—A controversial article.

Concerning the biological method for the examination of imported meat, M. Müller (*Ztschr. Fleisch u. Milchhyg., 19 (1908), No. 1, pp. 9–12*).—According to the author, the biological method may be satisfactorily used for the identification of dried intestines from different sorts of animals.

Sulphured fruit, H. Lührig (*Pharm. Centralhalle, 49 (1908), pp. 851–854; abs. in Chem. Centbl., 1908, II, No. 19, pp. 1622, 1623*).—The investigations carried on by the author indicate that the sulphur dioxid content of sulphured fruit varies so greatly in different portions that a large quantity should be available for inspection work rather than a small sample.

An electrical resistance method for the rapid determination of the moisture content of grain, L. J. Briggs (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 20, pp. 8, figs. 3*).—This circular describes an electrical method for determining the moisture content in wheat, to which the experiments have so far been confined. It was found that the electrical resistance of wheat containing 13 per cent of moisture is fifty times that of wheat containing 15 per cent. The temperature of the grain must be determined. The results show that the moisture content can be ascertained by this method with a probable error not exceeding 0.3 per cent. The measurements to be made require only 2 or 3 minutes. The apparatus is portable in character.

On fat determinations in feeding stuffs, A. G. Palmquist (*Svensk Kem. Tidskr., 20 (1908), No. 5, pp. 93–105, figs. 3; Landw. Vers. Stat., 69 (1908), No. 5–6, pp. 461–475; abst. in Analyst, 34 (1909), No. 396, pp. 101, 102*).—The author recommends a method similar to the Röse-Gottlieb method for determination of fat in feeding stuffs and perhaps other substances.

A 2 gm. sample of the finely ground material is heated direct on a water bath for 1 hour with 20 cc. 0.5 per cent hydrochloric acid in a flask the neck of which is graduated from 120 to 160 cc. The solution is then neutralized with 0.5 gm. of marble dust, cooled to about 50° C., and 20 cc. of 92 per cent alcohol added. When thoroughly mixed, 40 cc. of ether (specific gravity 0.72) is added and the mixture heated on a water bath at 45 to 50° for 30 minutes, the flask being connected with a reflux condenser inside of which a stirrer is rotated rapidly by means of a water turbine. After cooling in water to 17°, 60 cc. of petroleum ether (volatile below 75°) is added and shaken with the solution. After standing for an hour, 51 cc. of the ether-fat solution is pipetted off from the flask, placed in a 100 cc. Phillips beaker, evaporated at a low temperature, and weighed. The volume of the remaining portion of the fat solution is determined by inverting the stoppered flask and reading the volume on the graduated scale of the neck, and the total fat in the feeding stuff thus calculated.

A simple method for the quantitative separation of casein from human milk, Engel (*Biochem. Ztschr., 14 (1908), Nos. 3–4, pp. 234–237*).—The author added 500 cc. of water and 70 cc. of a 10 per cent normal solution of acetic acid to 100 cc. of milk. After standing for a few hours at a temperature of 3 to 4° C. the solution was placed in a water bath at 40° for a few minutes, when the casein separated completely from the whey in small flakes and was easily removed by filtration.

Estimation of the protein content of milk, A. A. Bonnema (*Pharm. Weekbl., 45 (1908), No. 41, pp. 1254–1259; abs. in Chem. Zentbl., 1908, II, No. 18, p. 1540*).—The protein in milk was found to contain an average of 14.3 per cent of nitrogen; hence, in estimating the protein content multiply the amount of nitrogen as shown by the Kjeldahl method by 6.99.

Estimation of sugar in cow's milk, C. Van Driel (*Pharm. Weekbl., 45 (1908), No. 42, pp. 1298–1305; abs. in Chem. Zentbl., 1908, II, No. 18, p. 1540*).—A comparison of the different methods indicates that the amount of lactose is not often accurately determined.

The estimation of inorganic compounds in milk, O. Allemann (*Landw. Jahrb. Schweiz, 22 (1908), No. 5, pp. 268–271*).—The loss of sulphur and chlorin by the customary methods of incinerating milk solids may be prevented by adding sodium peroxid. Analyses are given.

Characteristics of oils from certain expressed seeds, J. Kochs (*Chem. Rev. Fett u. Harz Indus., 15 (1908), No. 10, pp. 256, 257; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 21, p. 1072*).—The specific gravity, solidification point, butyro-refractometer numbers, and saponification, iodin and Reichert-Meissl

values of the oils extracted from the seeds of red currants, hips, tomatoes, raspberries, strawberries, and *Euonymus europæus* were determined, together with the melting point, iodin value, mean molecular weight, and percentage of unsaponifiable matter of the fatty acids obtained from these oils.

Characteristics of Japanese tea oil, M. Tsujimoto (*Chem. Rev. Fett u. Harz Indus., 15 (1908), No. 9, p. 224; abs. in Analyst, 33 (1908), No. 392, p. 424*).—"Two specimens of the seeds from the Japanese tea plant (*Thea sinensis*) yielded, respectively, 23.9 and 26.23 per cent of an orange-colored oil with a somewhat unpleasant odor and bitter taste. . . . The oil was readily soluble in the ordinary solvents for fats and it solidified at —10° C."

Color reactions of sesame oil with aromatic aldehydes and sugars, C. Fleig (*Bul. Soc. Chim. France, 4. ser., 3 (1908), No. 18–19, pp. 984–999; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 21, pp. 1072, 1073*).—The reactions with aromatic aldehydes are analogous with those obtained with furfurol in the Baudouin test. The intensity and stability of the color reactions may serve for the determination of sesame oil in mixtures with other oils.

Technical chemists' handbook, G. Lunge (*London, 1908, pp. XV+260*).—A revised edition of the Alkali Makers' Pocketbook, but enlarged to include chapters on feed-water for boilers, coal gas, calcium carbide and acetylene, fertilizers, aluminum salts, and alumina and calcareous cements.

Leather trades chemistry, S. R. Trotman (*London, 1908, pp. X+290, pls. 4, figs. 48*).—This work is intended to furnish data as to analytical details of modern processes most frequently met with in practice. The following topics are treated: Analysis of fuel, the estimation of nitrogen, preparation of standard solutions, water, effluents, depilation, deliming, qualitative recognition of tannins, analysis of tanning materials, common vegetable tannins, mineral tannage, analysis of spent liquors and tans, oils, soap, varnishes, skins, analysis of leather, fleshings and scutch, glue, benzine, dyestuffs, disinfectants, and antiseptics. A glossary of technical terms used in the tanning industry is appended.

METEOROLOGY—WATER.

Weather forecasts (*Lancet [London], 1908, II, No. 22, pp. 1613, 1614*).—This is a review of a paper by H. E. Rawson entitled A New Principle in Weather Forecasting and Its Importance in Naval and Military Operations, in which a method of forecasting based upon a 19-year cycle oscillation of the anticyclonic belts of the northern and southern hemispheres is proposed.

The occurrence of the foehn without subsequent precipitation, F. Mayr (*Ber. Naturw. Med. Ver. Innsbruck, 31 (1907–8), pp. 121–166*).—This article, which is based upon observations at the University of Innsbruck, 1897 to 1906, deals in considerable detail with the occurrence of foehns in Innsbruck; the meteorological behavior of foehns with and without precipitation, and the general distribution of air pressure in such cases; and northwest foehns. The fair weather foehn is a winter phenomenon. It is pointed out that the meteorological conditions connected with it are very different from those accompanying rain foehns, but in the author's opinion offer no safe basis for prediction.

A hailstorm following the course of an electric transmission-line, J. Violle (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 7, pp. 375–377; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 10, p. 555*).—A description is given of a hailstorm which followed closely the course of a 45,000-volt three-phase transmission-line for a distance of 8.7 miles. The observations indicate that the current had some effect in attracting and directing the storm.

The action of electric power lines on hailstorms, J. Violle (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 25, pp. 1371, 1372; Jour. Agr. Prat., n. ser.,*

17 (1909), No. 1, p. 14).—Referring to the above article, the author suggests the possibility of using this means for protecting vineyards and crops from damage by hailstorms.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observr., 1 (1908), pt. 4, pp. 207–277+IV, figs. 4, charts 6*).—This number contains the following articles: Pyrheliometer and Polarimeter Observations (illus.), by H. H. Kimball; Recent Auroral Displays and Magnetic Disturbances, by W. R. Gregg; Magnetic Declination, by E. R. Miller and W. R. Gregg; and Upper Air Temperatures for April, May, and June (illus.), by W. R. Blair.

Monthly Weather Review (*Mo. Weather Rev., 36 (1908), Nos. 9, pp. 275–324, figs. 12, charts 7; 10, pp. 325–356, figs. 4, charts 7*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of September and October, 1908, recent papers bearing on meteorology and seismology, recent additions to the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 9.—Résumé of Experiments in Aerodynamics, by A. F. Zahm; Hythers and the Comparison of Climates; The Relative Humidity of Our Houses in Winter; Scientific Ballooning and Weather Forecasts, by K. Bamler (trans. by A. G. McAdie); The Kite Station on Lake Constance (illus.), by E. Kleinschmidt (trans. by C. F. Talman); The Reflecting Power of Clouds (illus.); Early Meteorology at Harvard College, II, by B. M. Varney; Government Meteorological Work in Brazil (illus.), by R. DeC. Ward; Meteorology at the American Association for the Advancement of Science; The Isothermal Layer of the Atmosphere; Damages by Flood at Kansas City, Mo.; The Scientific Aspect of a Balloon Voyage (illus.), by H. H. Clayton; The Meteorological Work of the University of Jurjev (Dorpat), Russia, by E. Rosenthal; Prize Offered by the German Meteorological Society; A California Cloudburst, by J. S. Douglas; and A Mercurial Barograph of High Precision (illus.), by C. F. Marvin.

No. 10.—Deflecting Force Due to the Earth's Rotation, by R. A. Harris; Studies on the Vortices of the Atmosphere of the Earth (illus.), by F. H. Bigelow; Notes on Weather and Climate made during a Summer Trip to Brazil, 1908 (illus.), by R. DeC. Ward; Installation of Automatic River Stage Register at Hartford, Conn. (illus.), by W. W. Neifert; and The Meteorology of Mars, by S. Newcomb.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and R. C. Lindblad (*Massachusetts Sta. Met. Buls. 239, 240, pp. 4 each*).—Summaries of observation on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1908, are presented. The general character of the weather of each month is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.83, February 9; minimum, 28.86, January 8; mean, 30.044. *Air temperature*, in ground shelter (degrees F.).—Maximum, 96, July 12; Minimum, —12, February 5; mean, 47.6. *Humidity.*—Mean dew-point, 38.5; mean relative humidity, 75.8. *Precipitation.*—Total rainfall or melted snow, 30.68 in.; number of days on which 0.01 in. or more rain or melted snow fell, 109; total snowfall, 38.5 in. *Weather.*—Total cloudiness recorded by sun thermometer, 1,711 hours, or 39 per cent; number of clear days, 143. *Bright sunshine.*—Number of hours recorded, 2,743, or 61 per cent. *Wind.*—Prevailing direction, west-southwest; total movement, 63,571 miles; maximum daily movement, 594 miles, February 2; minimum daily movement, 10 miles, October 16; maximum pressure per square

foot, 30 lbs., April 11, north-northwest. *Dates of frost.*—Last, June 3; first, September 16. *Dates of snow.*—Last, April 20; first, November 3.

Meteorological summary for 1907, C. A. Patton (*Ohio Sta. Bul. 196, pp. 263–281*).—This summary includes as usual notes on the weather of each month and tabulated daily and monthly records of observations at the station at Wooster, Ohio, on temperature, precipitation, cloudiness, direction of the wind, etc., and for comparison, similar data for 20 previous years (1888–1907) at the station and for 25 years (1883–1907) in other parts of the State.

The mean temperature for the year at the station was 48.4° F.; for the State 49.6°; the highest temperature at the station 90°, August 12; for the State 98°, July 22; the lowest temperature at the station —14°, January 27; for the State —19°, February 6. The annual rainfall at the station was 40 in., for the State 42.9 in. The number of rainy days at the station was 138, for the State 129. The prevailing direction of the wind was north-southwest at the station and southwest for the State.

The climate of Innsbruck, A. Fessler (*Ber. Naturw. Med. Ver. Innsbruck, 31 (1907–8), pp. 3–96, charts 3; Appendix, pp. 67*).—Observations at the meteorological observatory of the University of Innsbruck on temperature, air, and vapor pressure, precipitation, humidity, winds, and cloudiness from 1891 to 1905 are summarized in text, tables, and charts.

The climate and meteorology of Australia, H. A. Hunt (*Off. Yearbook Aust. 1901–1907, pp. 115–141, dgms. 3, map 1; abs. in Nature [London], 78 (1908), No. 2034, p. 653*).—This is the first report of the Commonwealth Bureau of Meteorology of Australia, which was established something over a year ago. It gives a very brief general description of Australia from a meteorological standpoint, defines the meteorological advances of the country, and summarizes the results of observations on temperature, pressure, precipitation, evaporation, cyclones, storms, and winds. Special features are a comparison of the relative temperature and rainfall of different places and descriptions of certain characteristic storms. Attention is particularly called to forests as one of the more important factors affecting the climate.

Climate, R. DeC. Ward (*New York and London, 1908, pp. XVI+372; rev. in Science, n. ser., 28 (1908), No. 728, pp. 841, 842; Nature [London], 79 (1908), No. 2041, p. 155*).—In his review of this book in *Science*, Dr. O. L. Fassig says: "Ward's 'Climate' may be regarded as a supplement to the first volume of Hann's handbook, in which the author sets forth clearly and systematically some of the broader facts and relations of climate, primarily for the benefit of the general reader, although the needs of the teacher and student are not overlooked."

Geology and water resources of a portion of south-central Oregon, G. A. Waring (*U. S. Geol. Survey, Water-Supply Paper 220, pp. 86, pls. 10, fig. 1*).—The area reported upon in this paper lies mainly within and includes the greater part of Lake County. Data are given for geography, geology, hydrography, hydrology, reclamation projects, and soils.

The supply of available surface water in this region is not sufficient to irrigate all of the arable land. "The underground supply is as yet unknown, but on the whole, as has been shown, the indications seem favorable to the development of such water in the valleys of Silver, Christmas, and Summer lakes at least." The soils are very fertile and when irrigated become highly productive.

Geology and water resources of the Great Falls region, Montana, C. A. Fisher (*U. S. Geol. Survey, Water-Supply Paper 221, pp. 89, pls. 7*).—This report is based upon field work done during the season of 1906, covering an area of about 3,600 square miles in north-central Montana, mainly in Cascade and Teton counties, but including portions of Fergus, Chouteau, and Lewis and

Clark counties. It contains the usual summaries of data regarding geography, geology, and water resources, with notes on water power, irrigation, agriculture, climate, and possibilities of culture.

Preliminary report on the ground waters of San Joaquin Valley, California, W. C. MENDENHALL (*U. S. Geol. Survey, Water-Supply Paper No. 222, pp. 52, map 1*).—This paper contains a preliminary account of the geography and general geological conditions of the San Joaquin Valley and of the soils and surface waters, with a more detailed report on the nature, extent, distribution, availability, and development of underground waters for the whole area and for each county.

Ground waters and irrigation enterprises in the foothill belt, southern California, W. C. MENDENHALL (*U. S. Geol. Survey, Water-Supply Paper 219, pp. 180, pls. 9, figs. 16*).—This paper reports the results of a continuation of investigations begun in 1903 (E. S. R., 17, p. 708), covering the region lying along the south base of the San Gabriel Mountains from Cucamonga westward to Los Angeles. This area includes between 55,000 and 60,000 acres of irrigated land, largely in citrus fruits.

"In the same area there are about 40 flowing wells and nearly 400 pumping plants, representing an investment of at least $1,000,000 in wells and plants alone. There is, of course, an additional heavy investment in the connecting distributing systems. It is estimated that the pumping plants supply the equivalent of 80 to 100 second-feet of water, continuous flow, used largely for irrigation. This output is not regularly distributed throughout the year, but is largely concentrated in the dry months of July, August, and September, during which, after winters of light rainfall, the production of underground waters amounts to 300 second-feet or more."

The paper contains the usual data regarding geography, geological conditions, physiography, rainfall, and underground waters, with brief descriptions of the various irrigation enterprises.

Water conservation and irrigation (*Off. Yearbook Aust. 1901–1907, pp. 484–491*).—Brief accounts are given in this article of water-supply works, artesian wells, and irrigation plants in Australia.

The disinfection of drinking water with hydrogen peroxid, H. REICHEL (*Ztschr. Hyg. u. Infektionskrank., 61 (1908), No. 1, pp. 49–70, figs. 2; abs. in Chem. Zentbl., 1908, II, No. 18, p. 1544*).—Experiments are reported which indicate that ordinary drinking water can be thoroughly disinfected by 0.5 per cent of hydrogen peroxid in 24 hours, by 1.5 per cent in 6 hours, and by a 5 per cent solution in 3 to 4 hours. The latter is the shortest practicable time in which satisfactory disinfection can be secured.

The industrial uses of ozone, particularly for the purification of water, F. M. PERKIN (*Trans. Faraday Soc., 4 (1908), No. 2, pp. 81–94, pls. 2, figs. 6*).—The methods and appliances used for this purpose are quite fully described. It is stated that the use of ozone for the sterilization of water supplies for drinking purposes has the great advantages that it is extremely cheap, very efficient, and absolutely harmless.

The relative bacteriological contents of can, plate, and natural ice under various conditions, J. C. SPARKS (*Ice and Refrig., 35 (1908), No. 6, pp. 308–311*).—This article calls attention to conditions in a number of plants resulting in serious contamination of the ice produced.

Water supply and sewerage (*Ann. Rpt. Bd. Health Mass., 39 (1907), pp. 33–261*).—The subjects discussed in this report are as usual advice given to cities, towns, public institutions, and individuals regarding water and ice supply and sewerage, examination of public water supplies and rivers, water-supply statistics, and experiments on the purification of sewage and water at the Lawrence

Experiment Station in 1907, including purification of sewage and water filtration.

Sewage-grown crops (*Agr. Econ., 41 (1908), Nos. 467, pp. 289, 290; 468, pp. 317, 318*).—A general discussion of crops suited to sewage farming.

SOILS—FERTILIZERS.

The storage of winter precipitation in soils, J. A. WIDTSOE (*Utah Sta. Bul. 104, pp. 279–316, dgms. 4*).—This bulletin is based upon observations during several years on the variations in the moisture content of the soil, to a depth of 8 ft., on an irrigated farm and on several so-called dry farms. Detailed data are given for physical analyses of the soil and for their moisture content in fall and spring, with fall plowing and spring plowing of the land, with fall and winter irrigation, and with summer fallowing.

The results emphasize the fundamental importance of conserving the natural precipitation and making irrigation simply supplementary to it. "The natural precipitation over the larger portion of the Great Basin, if properly conserved by summer fallowing, is sufficient to produce crops without irrigation.

"The amount of moisture found in the soil in the fall depends on the crop grown, the total amount of water applied during the season, the summer precipitation, and, on an irrigated farm, on the date of the last irrigation. On an irrigated farm as high as 95.56 per cent and on nonirrigated farms as high as 93.17 per cent of the total winter precipitation were found in the upper 8 ft. of soil. The average of the maximum percentages of the winter precipitation found in the upper 8 ft. for 5 years on an irrigated farm was 82.13; for 3 years on nonirrigated farms, just reclaimed from the desert, was 61.85.

"The water capacity of soils under field conditions is low, usually not above 18 per cent. The drier the soil is in the fall the more of the winter precipitation is found in the first 8 ft. of soil." A comparatively small portion of the winter precipitation is lost from the soil by evaporation, but a considerable portion of it passes down through the soil below the eighth foot limit. "In the spring irrigated soils to a depth of 8 ft. are fully saturated and nonirrigated soils are usually so. . . . In the spring, less than 20 in. of precipitation are usually found in the upper 8 ft. of soil; that is, not more than the precipitation of one and one-half years is stored in the upper 8 ft. of soil.

"To make farming without irrigation successful, a considerable percentage of soil moisture must be carried over from year to year. Fall plowing tends to conserve the natural precipitation. Fall or winter irrigation is advisable on deep soils with good drainage. It should be practiced in moderation. . . . Summer fallowing conserves the soil moisture; the longer the fallow period, the higher the percentage of soil moisture. The reason why the beneficial effects of summer fallowing and fall plowing are not more evident in the soil moisture content is that the water capacity of most arid soils is small and that during the winter season a large portion of the water moves below the eighth foot limit reached by the soil augers.

"Lands may be water-logged even when only a small surplus of water is applied at each irrigation. The surplus moves to considerable depths until an impervious soil layer is reached, where the accumulation of water begins."

Quantity and composition of drainage water and a comparison of temperature, evaporation, and rainfall, J. H. NORTON (*Jour. Amer. Chem. Soc., 30 (1908), No. 7, pp. 1186–1190*).—The studies here reported were made in 1906 on the drainage basin of Richland Creek, covering an area of 84,954 acres in Madison and Washington counties, Arkansas, of purely agricultural lands on which no fertilizers had ever been used. The rainfall data were secured from

Weather Bureau stations near the boundary of the valley. Stream measurements were made approximately every 2 weeks from January 6 to December 23, and samples of water were taken for analysis at the same time. Determinations were made of chlorin, nitrogen, total solids, loss on ignition, and reaction. The drainage water per acre for the period covered was 59,470.92 cu. ft., the rainfall 202,520 cu. ft., the evaporation 143,049.08 cu. ft.

According to the analyses reported, the drainage water removed from 1 acre of the soil of this area in one year 794.638 lbs. of total solids, 349.296 lbs. of silica, 134.134 lbs. of organic and volatile matter (loss on ignition), 86.467 lbs. of alumina, 80.791 lbs. of lime, 17.728 lbs. of sulphur trioxid, 13.58 lbs. of chlorin, 10.065 lbs. of magnesia, 4.817 lbs. of potassium oxid, 4.012 lbs. of nitrogen, 3.01 lbs. of sodium oxid, 1.089 lbs. of ferric oxid, 0.953 lb. of manganous manganic oxid, and 0.657 lb. of phosphorus pentoxid.

The average composition of the surface 6 in. of soil of the region is given as follows: Water 5.53, silica 86.67, alumina 3.16, lime 0.20, sulphur trioxid 0.11, magnesia 0.16, potassium oxid 0.11, nitrogen 0.061, sodium oxid 0.16, ferric oxid 2.22, manganous manganic oxid 0.12, and phosphorus pentoxid 0.112 per cent.

"Taking the weight of 1 cu. ft. of soil at 70 lbs., this would mean that the drainage water removes 0.00313 in. of soil annually, or it would require about 300 years to remove 1 in. of soil by drainage water. . . .

"The annual loss per acre due to drainage water amounts to: Nitrogen, 60 cts.; potassium, 25 cts.; and phosphorus, about 4 cts. This would make an annual loss per acre of 89 cts.

"During the growing season the evaporation amounts to more than 90 per cent of the rainfall, while for the whole year the evaporation amounts to 70 per cent of the rainfall."

Distribution of water in the soil in furrow irrigation, R. H. Loughridge (*U. S. Dept. Agr., Office Expt., Stas. Bul. 203, pp. 63, figs. 19*).—This bulletin records the results of cooperative experiments carried on by this Office and the State of California to determine the extent in area and depth to which water percolates beneath furrows, as well as the proportion retained by the soil for the use of orchard trees. The experiments formed a part of a general study of the losses of water in irrigation and their prevention, investigations on evaporation having already been reported (E. S. R., 18, p. 1087).

The experiments were made mainly on sandy loam soils in citrus orchards near Riverside, Cal. The character of the soil and its moisture content to a depth of several feet were determined before the experiments were begun.

To ascertain the rate of movement of the irrigation water in the soil and the amount of moisture retained, trenches were dug across the irrigation furrows to a depth of 5 or 6 ft. and of convenient width. By means of these trenches it was possible to trace the rate and extent of percolation of the irrigation water and also to take samples at any desired depth for determination of moisture.

In view of the somewhat unusual character of the investigations, an important feature of the work was the development of methods suitable to the purpose. The experience gained indicates certain important improvements in methods, which are described in detail. The principal results of the percolation studies are summarized as follows:

"The preliminary examination of the land of the orchard before irrigation showed that the upper 2 ft. held only about 3.5 per cent of free water as the general average, while below this to the depth of 13 ft. the average was 6.16 per cent. The roots of the trees were mostly confined to the upper 4 ft., and in this depth there was an average of 4.68 per cent, an amount sufficient to

maintain a good appearance in the trees but not to produce new growth; the application of irrigation water caused increased growth.

"The unobstructed movement of water in loam soils is downward, with great irregularity in rate of progress and in the amount of water retained at various depths. The water beneath the surface does not move from the furrows toward the trees for more than 2 ft., and at a depth below 2 ft. the wet area is usually rapidly contracted to a cone shape. The soils in the tree rows, therefore, fail to receive any of the irrigation water, and the dry space increases in width and extent downward; the tree roots, which usually are confined to the upper 3 ft., are thus only partially supplied with needed moisture.

"The relative proportion of dry soil to that wetted by irrigation across 16 furrows and 4 tree rows in the sandy loam soil, was as 2 to 3 in a depth of 5 ft. As seen in the profiles, the proportions are as follows, taking the dry soil as the unit: Surface foot, 1 to 3.4; second foot, 1 to 4.3; third foot, 1 to 2.3; fourth foot, 1 to 0.8; fifth foot, 1 to 0.4; and sixth foot, 1 to 0.1.

"The depth reached by the percolation of irrigation water depends on the nature of the soils and length of time of flow; in the unobstructed loose soil it was 26 ft. near the head ditch, 4 ft. in the middle, and about the same at 30 ft. from the end, and many feet where the excess was received. In the compact, semiimpervious soil it reached a depth of 4 ft., while in the impervious hardpan soil the depth was but little more than 12 in. even after 3 days' application.

"The amount of water held by the soil when the downward movement ceased was always greatest in the upper 2 ft. and diminished in percentage to the bottom. [The general averages of 9 furrows were] 9.95 per cent in the first foot, 11.19 in the second, 9.14 in the third, and 8.27 per cent in the fourth foot.

"The presence of an impervious hardpan near the surface causes sidewise seepage of the water, a greater wetting of the surface, and consequent increased loss by evaporation and by accumulation and run-off at the lower end of the furrows.

"Shallow irrigation furrows do not give as good results as deep ones; they allow a large part of the water to rise by capillarity to the surface on either side and thence to escape into the air by evaporation, while deep furrows enable the soil to receive and retain nearly all of the water applied. The furrows in [the principal orchard experimented with] had an average depth of 3 or 4 in. and from these the lateral seepage was so great as to wet about 85 per cent of the space between the tree rows. During the 3 days of irrigation in which these soils were being kept wet the rate of evaporation was very high. After this the soil gradually dried out and the loss diminished.

"On loose sandy loams water percolates with such rapidity near the head ditch that a great part is lost by passing far below the roots and possibly into sand and gravel strata, through which it flows away. Thus on [one] orchard the depth of percolation was 26 ft. at a distance of 30 ft. from the ditch.

"It is extremely doubtful [whether] water at a depth of more than 5 ft. below the root systems will be of any benefit to the trees in times when needed, for the capillary rise is extremely slow, and especially so if the temperature of the soil be low. . . .

"In orchards with shallow mulches it was observed that the amount of water in the soil 6 weeks after irrigation was about the same as just previous to the application of water. . . .

"Percolation is influenced by the time that water is allowed to remain in the furrow. The water should be made to reach the end of the furrow as soon as possible, and then the flow so regulated that the whole line may receive prac-

tically the same amount and to depths of 8 or 10 ft. If the movement is slow and the soil conditions favorable to percolation, then in the soil near the head ditch there is danger of loss by the percolation of the water far beyond the reach of the root systems."

The physical condition of the soil in relation to agriculture. T. HALLISSY (*Irish Farming World, 21 (1908), No. 1081, pp. 1143, 1144; Farmers' Gaz., 67 (1908), Nos. 47, pp. 1013, 1014; 48, p. 1033*).—This is a report of a lecture in which the influence of the various physical factors on the fertility of the soil was discussed, but special emphasis was laid upon the relation of the soil to water.

While not minimizing the importance of the chemical and biological conditions of the soil, the author stated that "texture is what the farmer has always made the basis for his diagnosis as to its value, and modern science confirms his judgment."

Investigations on the composition of the air of cultivated soils. E. LAU (*Beiträge zur Kenntnis der Zusammensetzung der im Ackerboden befindlichen Luft. Inaug. Diss. Rostock, 1906, pp. 34, pl. 1, fig. 1; rev. in Zentbl. Agr. Chem., 37 (1908), No. 7, pp. 433, 434*).—A series of investigations on the conditions which influence the composition of the soil air is reported, from which the following conclusions are drawn:

The soil air is richest in carbon dioxid in summer and poorest in winter, the amount apparently varying with the temperature and the consequent intensity of the decomposition of the organic matter and the formation of carbon dioxid. The maximum carbon dioxid content was noted in the months of July and August, the minimum in February. The soil air is poorer in carbon dioxid at 2 o'clock at night than at 2 o'clock in the day.

The air of sandy soils contains the least carbon dioxid, that of moor soils the most, the air of loam soils being intermediate in this respect. The carbon dioxid content varies with the humus content as well as with the physical properties of the different soils. It is smallest at the surface and increases with the depth, the differences in this respect being greatest in case of moor soils and least in sandy soils.

The oxygen content stands in definite relation to the content of carbon dioxid, that is, the richer the soil air in carbon dioxid the poorer it is in oxygen, this being clearly due to the fact that the carbon dioxid results from the oxidation of humus.

Plant root respiration has a marked effect upon the carbon dioxid content of the soil air. The air of soils bearing plants is decidedly richer in carbon dioxid than that of bare soils, and the carbon dioxid content is greater in the vicinity of the plant roots than below them. The carbon dioxid content increases with the growth of the plants and with the rise of temperature. Soils bearing potatoes and lupines contain larger amounts of carbon dioxid than the same soils bearing other crops. This is attributed to the fact that potatoes and legumes have a higher rate of respiration than other plants.

The application of barnyard manure is equally as effective as the root action in increasing the carbon dioxid content of soil air.

The content of radio-active emanations in soil air. A. GOCKEL (*Phys. Ztschr., 9 (1908), No. 9, pp. 304–306*).—Measurements of the emanations in soil to a depth of 1 meter showed wide variations with different conditions of the soil and weather.

The absorptive power of a cultivated soil. J. ROSEN and C. HELLER (*Bot. Gaz., 46 (1908), No. 3, pp. 224–229, figs. 3*).—Experiments with wheat seedlings grown in solutions of different concentrations of disodium phosphate, potassium

chlorid, and sodium nitrate alone or combined with soil extract and soil gave results indicating that the increased tolerance of wheat seedlings to these salts when used in soil as compared with water solutions and soil extract solutions was due to the absorptive power of the soil for the salts. This conclusion is sustained by the facts that (1) the soil as shown by chemical analysis actually exerted considerable absorptive power for certain of the salts, (2) in case of the nitrate, upon which the soil exerted no absorptive power, there was no effect on the tolerance, and (3) tolerance increased with the increase of the absorptive power, both factors being lowest in the quartz, higher in the unmanured soil, and highest in the manured soil.

The colloids of cultivated soils, P. Ehrenberg (*Ztschr. Angew. Chem., 21 (1908) No. 41, p. 2122*).—This is an abstract of a paper read before the eightieth convention of the German Association of Naturalists and Physicians.

Soil colloids are classified and discussed with reference to their properties and behavior, particularly their flocculation or coagulation under the influence of low and high temperatures, drying, admixture of sand, alkali salts, lime compounds, physiological and biological processes, ether, and carbon bisulphid.

The article emphasizes the importance of the colloids in maintaining cultivated soils in proper condition.

Topographic mapping of bottom lands in Illinois, E. W. McCrary (*Engin. News, 60 (1908), No. 13, pp. 333, 334*).—This article explains briefly the methods pursued by the State Geological Survey in cooperation with the U. S. Geological Survey in the topographic mapping of portions of the drainage areas of the Kaskaskia, Big Muddy, and Embarras rivers.

Superficial and agricultural geology—Ireland, No. 2.—Soils, G. H. Kinahan (*Dublin, 1908; rev. in Chem. Trade Jour., 43 (1908), No. 1116, p. 333*).—This book contains in its introduction a discussion of agriculture in general and Irish agriculture in particular. Particular attention is also given to the bog soils and bog agriculture.

Soil analyses, A. Amos and E. J. Russell (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 215–240*).—As a part of a complete survey which is to be reported in full later, this article describes different classes of soils—sandy soils, loams, calcareous soils, and clay soils—as typified by soils of Surrey, Kent, and Lincolnshire, of which analyses are given.

Deli soils, J. G. C. Vriens (*Meded. Deli-Proefstat. Medan, 2 (1908), No. 3, pp. 175–236*).—Analyses of a large number of Deli tobacco soils are reported, the word Deli in this case being used to cover the whole of the east coast of Sumatra where the Deli tobacco is grown.

On the weathering of soils and the value of mineralogical-petrographic soil analysis, A. von 'Sigmond (*Földtani Közlöny, 38 (1908), No. 3–4, pp. 220–230*).—Mineralogical-petrographic studies of various Hungarian soils, the results of which confirm the conclusions of Delage and Lagatu (E. S. R., 17, p. 841) are reported. The importance of such studies is emphasized.

The alkali soils of the great Hungarian Alföld, P. Treitz (*Földtani Közlöny, 38 (1908), No. 1–2, pp. 106–131, pl. 1, fig. 1*).—These soils are described and their origin and composition are discussed.

The author concludes from his studies of these soils that the soluble salts found in them are derived from the ash constituents of the plants produced on the soil, and that the first and most necessary condition for the formation of sodium compounds, particularly the carbonate, is a calcareous subsoil, carbonates of the alkalis being formed by the action of calcium carbonate on the humates, sulphates, and chlorids of the alkalis. During the wet season of the year the carbonate of soda dissolved in the soil moisture of the upper layers of the

soil is carried down into the subsoil where it is brought into contact with gypsum and converted into sodium sulphate. In the warmer and drier portion of the year the water containing this sulphate rises to the surface soil and the sulphate is there again converted into carbonate. It thus happens that the composition of the alkali salts in the same soil is very variable at different seasons of the year.

Lime and phosphates in Rhodesian soils, J. Cameron (*Rhodesian Agr. Jour., 5 (1908), No. 3, pp. 155–159*).—It is stated that the most marked feature of Rhodesian soils is the low content of lime with a rather small supply of phosphates. Attention is also called to the calcareous and phosphatic deposits which are found in ant heaps occurring on the soils. The core-like material occurring in these heaps was found to contain 38 per cent of carbonate of lime, 3.5 per cent of phosphoric acid, 2 per cent of magnesia, and 3 per cent of iron. It is believed that this material has been formed at the expense of the lime and phosphoric acid of the surrounding soils. When these mounds are broken up and scattered over the soils their fertility is greatly increased.

Investigations on the fertility of noncalcareous soils, G. Paturel (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 40, pp. 419–422*).—This article calls attention to certain soils which do not contain any calcium carbonate and yet are in many cases abundantly supplied with lime, generally in the form of humate, which is easily soluble and assimilable by the roots of plants.

Analyses of 5 samples of such soils, containing from 0.32 to 1.15 per cent of lime, are reported, as well as fertilizer experiments with one of the soils. A sample of one of the soils containing 0.49 per cent of lime yielded one-fifth of its lime on extraction with distilled water and 40 per cent on extraction with 1 per cent citric acid.

Experiments have shown that these soils are benefited by applications of lime to only a slight extent, but that applications of phosphates produce marked results. It is thought that superphosphates are likely to prove more efficient on these soils than Thomas slag.

The status of soil fertility investigations (*Illinois Sta. Circ. 123, pp. 3–56*).—This is a collection of documents relating to the controversy in connection with the theories of soil fertility of the Bureau of Soils of this Department.

Chemical principles of soil classification, C. G. Hopkins (*Science, n. ser., 28 (1908), No. 729, pp. 857–868*).—This is an address delivered before the American Society of Agronomists at Cornell University in July, 1908, discussing the theories of the Bureau of Soils of this Department regarding soil fertility.

Chemical principles of soil fertility, C. G. Hopkins (*Illinois Sta. Circ. 124, pp. 16*).—See abstract above.

Bacteria for enriching the soil and for increasing the production of crops, N. N. Banerjei (*Dept. Agr. Bengal, Quart. Jour., 1 (1908), No. 4, pp. 221–228*).—This is a brief account of experiments in inoculating seed and soil with dry cultures prepared by this Department and liquid cultures prepared in Germany for the production of cowpeas. The results, while not conclusive, indicate that in certain cases decided benefit was derived from the use of the inoculating material.

Notes on inoculation with Nitragin and inoculated soil in the culture of leguminous plants and its importance in fruit and garden culture, B. Heinze (*Proskau. Obstbau Ztg., 13 (1908), Nos. 6, pp. 87–92; 7, pp. 106–109*).—Inoculation by means of Nitragin or infected soil is considered advisable in many cases.

Inoculation of gram seed with the tubercle-forming bacteria, J. M. Hayman (*Rpt. Cawnpore [India] Agr. Sta., 1907, pp. 63, 64*).—Pot and field experiments

in which seed was inoculated with cultures prepared from root nodules of the gram and planted in sterilized and unsterilized soil are reported. The benefit of inoculation was marked in the pot experiments but not noticeable in the field experiments.

Protection of the soil in Hungary, R. Gonnard (*Rev. Écon. Internat., 5 (1908), IV, No. 1, pp. 67–98*).—This article explains what is being done by organization and government supervision to protect and improve the soils of Hungary, more particularly by forest management and control of waters.

Terracing of farm lands, W. W. Ashe (*N. C. Geol. and Econ. Survey Bul. 17, pp. 38, pls. 6, figs. 2*).—This bulletin briefly describes the coastal, Piedmont, and mountain regions of North Carolina and discusses in some detail the value and characteristics of the soils of the Piedmont region, the extent and cause of soil erosion and its effect on the quality of the soil, kinds of soils subject to erosion, and methods of lessening erosion with particular attention to the value and construction of terraces for this purpose in the Piedmont region of the State.

The advantages of terracing as a means of preventing erosion are stated to be in brief as follows: A reduction in the cost and labor of maintaining a tillable surface soil which is free from gullies, an increase in general fertility, and a corresponding increase in land values. Particular stress is laid upon the importance of using in connection with terracing a system of cropping and manuring which will increase the humus content of the soil.

Improvement and management of eastern Virginia lands, W. C. Stubbs (*South. Planter, 69 (1908), No. 10, pp. 866–869*).—The character of the soils of this region and the cultural management to which they have been subjected are discussed. A system of rotation and manuring based upon actual experiments on a typical soil of the region is described. This rotation includes first corn, followed by cowpeas or soy beans as a summer crop, wheat as a winter crop, and crimson clover as a spring and summer crop. Acid phosphate is used at the rate of 100 to 200 lbs. per acre with each crop.

Experiments with fertilizers showed that notwithstanding the fact that the soil had been cropped with tobacco for many years it did not respond to applications of potash fertilizers. Phosphoric acid was evidently the constituent most needed and nitrogen in combination with phosphoric acid gave profitable increase in yield. A sufficient amount of nitrogen, however, is supplied by the leguminous crops in the rotation described.

The study of the phosphoric acid and lime requirements of cultivated soils by means of field experiments on grass lands, P. Liechti (*Chem. Ztg., 32 (1908), No. 84, p. 1019*).—A report of the results of 3 years' cooperative experiments in different parts of Switzerland is reviewed. The method of organizing and conducting the experiments is also described. Of the single fertilizer elements, phosphoric acid gave the greatest increase in yield of forage. The addition of potash to the phosphoric acid gave a slightly larger increase.

Fertilizer experiments at the Biological Agricultural Institute of Amani, V. Lommel (*Pflanzer, 4 (1908), Nos. 9, pp. 140–144; 10, pp. 145–160; 11, pp. 161–170*).—Pot and field experiments with compost, barnyard manure, and commercial fertilizers on coffee, sisal, cotton, cocoanuts, and rubber plants are reported. The coffee did not grow normally in pot (cement cylinder) experiments and the field experiments have not yet been carried on long enough to give conclusive results.

Manuring experiment on flooded (rice) ground, J. E. van der Stok (*Teysmannia, 19 (1908), No. 6, pp. 389–399*).—This is a comparison of stable manure

with sulphate of ammonia for rice growing. The stable manure was applied at the rate of about 19 tons per acre and the sulphate of ammonia at the rate of 384 lbs. per acre. Two varieties of rice were used. The sulphate of ammonia gave the largest returns both in rice and straw with each variety; the percentage of increase of rice over the plats without manure was 26 and 31, of straw 72 and 40. With stable manure the increase over the unmanured plats was 12.5 and 15 per cent of rice and 21 and 9 per cent of straw, for the 2 varieties used.

Note on action of nitric acid in neutralizing alkaline soil, R. S. Symmonds (*Jour. and Proc. Roy. Soc. N. S. Wales, 41 (1907), pp. 46–48, pl. 1*).—Pot experiments with wheat in which an alkaline soil was treated with 0.2, 0.5, and 1 per cent of nitric acid are reported, the treated soil giving more than five times the yield of the untreated soil. It is suggested that the flow of artesian wells might be utilized to produce by electrochemical means the nitric acid required to correct alkalinity in soils and irrigation water. The probable cost of such an installation is briefly discussed.

Artesian waters (*Jour. Dept. Agr. So. Aust., 11 (1907), No. 4, pp. 362–370, figs. 3; 12 (1908), No. 2, pp. 132–136, figs. 2; Queensland Agr. Jour., 21 (1908), No. 3, pp. 148–151, figs. 3*).—These articles contain further discussion of the proposal of Symmonds, noted above, to use the power of flowing artesian wells to produce the nitric acid needed to neutralize alkaline soils and irrigation waters.

Artesian irrigation: An antidote for alkaline waters, R. S. Symmonds (*Agr. Gaz. N. S. Wales, 19 (1908), No. 8, pp. 609–627, figs. 8, map 1*).—This is a somewhat more detailed account of the experiments noted above.

The article calls attention to the frequent occurrence and injurious effect of alkali in artesian waters used for irrigation in New South Wales. The experiments reported show that this alkali can be neutralized successfully with nitric acid with great advantage in the growth of wheat. It was also found to be possible to manufacture successfully an efficient superphosphate by the use of nitric acid. It is suggested that the flow of the artesian wells may be made to furnish electric power for the production of the nitric acid needed, and data are given showing the power of flow of a number of such wells.

The most economical sources of nitrogen for plant food, L. A. Clinton (*Ann. Rpt. Conn. Bd. Agr., 40 (1906), pp. 153–164*).—This article discusses briefly the relative value and economy of different materials used to supply nitrogen in fertilizers, including nitrate of soda, ammonium sulphate, dried blood, fish and tankage, and farm manures. Conditions controlling the nitrification and availability of nitrogenous fertilizers in the soil are also briefly explained.

The behavior of lime nitrogen and nitrogen lime in storage and in soils, M. Popp (*Chem. Ztg., 32 (1908), No. 80, p. 972; Österr. Chem. Ztg., 11 (1908), No. 23, p. 317*).—It is stated that losses occur when the lime nitrogen is stored damp in thin layers. Decomposition in the soil depends upon the character and the bacterial activity of the soil. The conditions in loam soil seem more favorable than in sandy soil to the rapid rendering of the nitrogen available. Excessive water checks but does not stop this change. Small applications of the lime nitrogen are more rapidly transformed than large, and excessive amounts prevent bacterial action altogether and are poisonous to seeds and higher plants.

In pot experiments it was found that lime nitrogen was 90 per cent as effective as nitrate of soda and 95 per cent as effective as sulphate of ammonia. Twenty per cent of the effectiveness of the lime nitrogen may be lost by applying it

with the seed or entirely as a top-dressing to the growing crop. The best results followed application about 14 days before seeding, the material being deeply and thoroughly mixed with the soil. Dicyandiamid, although not affecting germination, has no fertilizing value, and plants taking it up make less growth than those without nitrogenous fertilizers.

Experiments on the use of calcium cyanamid as a fertilizer, A. Stutzer (*Ztschr. Angew. Chem., 21 (1908), No. 41, p. 2122; Chem. Ztg., 32 (1908), No. 80, p. 972; Österr. Chem. Ztg., 11 (1908), No. 22, p. 306*).—This paper, read before the eightieth convention of the Association of German Naturalists and Physicians, summarizes the results of experiments with lime nitrogen on various crops, showing that with proper precautions the material is as a rule an excellent fertilizer.

The influence of potash fertilizers on the relation of grain to straw, Clausen (*Deut. Landw. Presse, 35 (1908), No. 81, p. 851*).—The author found in pot and field experiments that in case both of leguminous plants (peas and beans) and of cereals (oats and rye) potash fertilizers (kainit) increased the proportion of seed to straw to a marked extent.

Silicate of potash as a fertilizer, E. Wein (*Deut. Landw. Presse, 35 (1908), No. 76, pp. 801, 802*).—This is a preliminary note on field experiments in which silicate of potash was compared with other common forms of potash fertilizers. It is stated that the results of 4 years' experiments have shown that the silicate is an efficient potash fertilizer and that it is less subject than other potash salts to loss from leaching of the soil when applied in large amounts.

Wood ashes as a fertilizer, A. M. Ten Eyck (*Market Growers' Jour., 3 (1908), No. 19, p. 11*).—The fertilizing value and the best methods of using ashes are briefly explained.

Experiments on methods of application of superphosphates, L. Malpeaux (*Jour. Agr. Prat., n. ser., 16 (1908), No. 39, pp. 396–398*).—On wheat and crimson clover superphosphate gave the best results when applied at a depth of 10 cm. as compared with application at the surface and at a depth of 20 cm. On barley the best results were obtained by applying in the fall and mixing well with the soil. On sugar beets also the superphosphate gave the best results when well mixed with the soil. The results in general were unfavorable to top-dressing and spring application.

The agricultural value of low-grade Thomas slag, M. de Molinari and O. Ligot (*Ann. Gembloux, 18 (1908), No. 10, pp. 555–558, pl. 1*).—Comparative pot tests of two low-grade slags containing, respectively, 4.76 and 3.94 per cent of phosphoric acid, on oats on sandy clay soil are reported. The results show that such slags even when used in amounts furnishing the same ration of total phosphoric acid as normal slags are much less effective than the latter, but that when reenforced with citric-acid soluble phosphoric acid they produce the same yield as normal slag.

The solubility of steamed bone meal in 2 per cent citric acid, J. Turk (*Chem. Ztg., 32 (1908), No. 85, pp. 1034, 1035*).—Tests are reported to show that the solubility in 2 per cent citric acid varies widely with the total amount of phosphoric acid in the sample used and that comparable results can be obtained only by using amounts of sample containing approximately the same amount of phosphoric acid. Because this fact is not taken account of in comparative tests of steamed bone and Thomas slag, the results in many cases are thought to be misleading.

The price and value of raw phosphates and so-called agricultural phosphates (*Deut. Landw. Presse, 35 (1908), No. 73, p. 772*).—This is in the main a warning against extravagant claims for these phosphates.

The action of gypsum as a fertilizer. M. Soave (*Staz. Sper. Agr. Ital., 41 (1908), No. 8, pp. 473–500, figs. 2; abs. in Chem. Zentbl., 1908, II, No. 19, p. 1627*).—This article contains a general discussion of this subject and reports a series of pot experiments to determine the chemical effect on soils of the application of gypsum and to compare the effect of gypsum with that of sulphate of potash on corn and beans. The effect of gypsum alone was insignificant. When combined with soluble potash, however, it seemed to produce a beneficial effect.

Manganese sulphate. M. de Molinari and O. Ligot (*Ann. Gembloux, 18 (1908), No. 11, pp. 609–611*).—Tests of this material as a fertilizer on oats and barley grown in pots on soil containing 0.12 per cent of manganese are reported. No benefit from its use was observed. The same was true in similar tests of the sulphates of iron, copper, and zinc.

The action of zinc in pot experiments. P. Ehrenberg (*Abs. in Chem. Ztg., 32 (1908), No. 78, p. 937*).—This is an abstract of a paper presented before the eightieth convention of the German Association of Naturalists and Physicians, which reported experiments to determine the effect of zinc in the soil on the physical and chemical properties of the soil and on the germination of seeds and growth of plants. Experiments were made with zinc plates buried in pots containing different kinds of soil and receiving different kinds of fertilizers. It was noted especially that the injurious effects were most marked in case of the use of ammonium salts as fertilizers. This is attributed to the corrosive action of ammonia set free by the reaction of the zinc on the ammonium salts.

Influence of the weather on the action of commercial fertilizers. W. von Sycianko (*Fühling's Landw. Ztg., 57 (1908), No. 20, pp. 698–701*).—Reference is made to a previous article by Grohmann (E. S. R., 20, p. 311) which maintained that the results of many of the experiments heretofore made do not permit of reliable conclusions because no exact account was taken of the influence of weather conditions, and an attempt is made to show the direct relation between varying conditions of moisture and temperature and the action of fertilizers as demonstrated by observations on fertilizer experiments with strawberries, carrots, kohl-rabi, peas, and other vegetables in which the results were carefully correlated with the weather conditions.

On the mixing of commercial fertilizers. B. Schulze (*Deut. Landw. Presse, 35 (1908), No. 76, p. 803, fig. 1*).—This article explains briefly in text and diagram what fertilizing materials can safely be mixed and which should not be mixed.

The use of peat in the preparation of fertilizers, ammonium salts, and nitrates. H. Rousset (*Rev. Gén. Chim., 11 (1908), No. 17, pp. 305–311, figs. 4; abs. in Chem. Ztg., 32 (1908), No. 84, Repert., p. 532; Ztschr. Angew. Chem., 22 (1909), No. 5, p. 207*).—This is a study of the methods of Rickmann, Woltereck, Müntz and Girard, and Gaillot and Brisset, which are based upon the conversion of peat nitrogen into ammonia and the formation of nitrates from the ammonia.

Obtaining ammonia from atmospheric nitrogen by means of peat. H. C. Woltereck (*Abs. in Chem. Ztg., 32 (1908), No. 78, p. 941; Chem. News, 98 (1908), No. 2549, p. 163; Jour. Bd. Agr. [London], 15 (1908), No. 12, p. 928*).—In this abstract of a paper presented at the recent Dublin meeting of the British Association for the advancement of Science, attention is called to a method now in use in Ireland (Carnlough) in which ammonia is produced by passing air and water vapor over peat at a low heat in especially devised furnaces. Besides sulphate of ammonia (amounting to 5 per cent of the dry peat), other products,

such as acetic acid, paraffin, tar, and ashes of considerable fertilizing value, are obtained.

Nitrogenous fertilizers prepared from peat, MAIZIÈRES (*Engrais, 23 (1908), No. 39, pp. 924–926*).—This is a brief review of methods which have recently been proposed for this purpose, especially those of Bazin and Woltereck (E. S. R., 19, p. 1124; 20, pp. 23, 523).

Nitrate from ammonia, K. W. JURISCH (*Chem. Ztg., 32 (1908), No. 67, pp. 791, 792*).—This is a review of investigations dealing with the oxidation of ammonia to nitric acid. The Ostwald method receives particular attention.

On lime nitrogen, G. BREDIG (*Chem. Ztg., 32 (1908), No. 69, pp. 810, 811*).—Studies on the rate of fixation of nitrogen by calcium carbonate with and without the addition of catalytic substances and with varying pressures are reviewed in this note.

Cyanamid or lime nitrogen (*Amer. Fert., 29 (1908), No. 5, pp. 18, 19, figs. 3*).—This is an illustrated description of works which are being built at Niagara Falls, Ontario, for the manufacture of calcium cyanamid. It is stated that these works are to have a capacity of 15,000 tons per annum.

Chilean nitrate fields, R. HANNA (*Amer. Fert., 29 (1908), No. 5, pp. 10–12; Jour. Indus. and Engin. Chem., 1 (1909), No. 1, pp. 45–47; Mo. Cons. and Trade Rpts. [U. S.], 1909, No. 340, pp. 181–185*).—This article explains briefly how the nitrate industry is conducted and discusses composition, shipping methods, and available deposits.

Nitrate of soda (*Amer. Fert., 30 (1909), No. 2, pp. 8, 9*).—This article gives in brief the official Chilean estimate of the extent of nitrate deposits in that country as reported by Consul R. Hanna. The estimate in 1906, confirming that of 1896, showed a possible production in the nitrate zone of 81,440,000 short tons.

Peruvian guano (*Mark Lane Express, 99 (1908), No. 4024, pp. 525, 527, figs. 3*).—This is a brief general account of the history, present supply, and characteristics of Peruvian guano, with suggestions as to soils and crops best suited to its use and methods of preparing and mixing the guano. Data are also given regarding the price and conditions of sale of the guano in England and its influence on British farming.

Phosphate deposits of Christmas Island, H. P. WOODWARD and E. S. SIMPSON (*Jour. Dept. Agr. West. Aust., 17 (1908), Nos. 1, pp. 552–556; 2, pp. 589–592*).—Explorations which indicate the occurrence of at least 50,000 cu. yds. of phosphatic shale and travertin limestone containing from 13.5 to 23.5 per cent of phosphoric acid are reported.

Deposits of phosphates in the Midland districts [of Western Australia] (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 3, pp. 676–682*).—The discovery of deposits of low-grade phosphate is reported.

Natal mineral phosphates, A. PARDY (*Natal Agr. Jour., 11 (1908), No. 9, pp. 1090–1092*).—Analyses of 5 samples of these phosphates are given. The percentage of phosphoric acid varied from 10.98 to 36.35 per cent. The richer sample, however, contained a rather high percentage of fluorin, which would be a drawback in the case of the use of the phosphate in the manufacture of superphosphates.

Acetylene plant residue, A. PARDY (*Natal Agr. Jour., 11 (1908), No. 8, pp. 947, 948*).—An analysis of the lime residue from the generation of acetylene gas is reported and its value as a fertilizer briefly discussed. The material was found to contain 60.1 per cent of calcium carbonate, 29.5 per cent of calcium hydroxid, and 7.8 per cent of moisture, besides small amounts of magnesia,

silica, iron, alumina, etc. The material is considered a valuable lime fertilizer, but should be thoroughly saturated with water and aerated before crops are planted on land to which it is applied. This is best done by spreading on bare land in winter a considerable time before planting the crop.

Utilizing the dogfish. A. J. Fleming (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 3339, pp. 13, 14*).—The methods and appliances used at Canso and Clarks Harbor, Nova Scotia, and at Shipegan, New Brunswick, for extracting oil from dogfish and making fertilizer from the residue are described. The Canso works are planned to reduce about 25 tons of fish in 24 hours, and the Clarks Harbor plant will reduce 30 tons of fish in 10 hours. The works have proved remunerative both to the operators and to fishermen.

Utilizing stock-yard waste (*Breeder's Gaz., 54 (1908), No. 20, pp. 905, 906*).—This article briefly discusses the increased demand for and improved methods of handling the large accumulations of stock-yard manure. It calls attention to the fact that a product that was formerly dumped into the streams or gotten rid of by some other simple means can now be completely disposed of as a fertilizer at prices of from $6 to $8 per carload of coarse manure and of $18 per ton for assorted pulverized manure in bags.

The disposal of sewage sludge (*Chem. Trade Jour., 43 (1908), No. 1115, p. 309*).—The Grossmann process in use at Manchester, England, is described. This consists essentially of mixing the pressed sludge with a small quantity of acid and subjecting it to the action of superheated steam. This removes fatty matter and leaves behind a dry, practically odorless material containing 2 per cent of ammonia and about 2 per cent each of phosphoric acid and potash.

Sewage sludge as a manure (*Times [London], 1908, Sept. 28; abs. in Jour Soc. Chem. Indus., 27 (1908), No. 19, p. 995*).—In this article reference is made to a report published in a parliamentary paper of experiments made by the British Board of Agriculture to test the fertilizing value of different kinds of sludge on mangels, turnips, and grass under ordinary farm conditions, and on wheat in pot experiments. None of the sludges showed any particular value as a fertilizer.

Chemicals and allied products, C. E. Munroe (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 4, pp. 397–512*).—This report gives statistics of production, consumption, and imports up to and including 1905, the statistics of most interest from an agricultural standpoint being those relating to acids, ashes, and other fertilizers.

According to the statistics given the total value of the fertilizer output in the United States in 1905 was $56,632,853, an increase of 26.8 per cent over the value in 1900; the number of establishments was 400, a decrease of about 5 per cent since 1900. In the same time the capital invested ($69,023,264 in 1905) had increased about 14 per cent, the number of salaried officials had decreased 5.5 per cent, and salaries 8.7 per cent; the number of wage-earners had increased 22.6 per cent and wages 22.9 per cent. Of the total output, 1,670,978 tons, valued at $16,495,206, was superphosphate; 781,354 tons, valued at $13,020,825, was ammoniated superphosphate; 1,603,847 tons, valued at $31,305,057, was complete fertilizer; and 419,803 tons, valued at $4,826,656, miscellaneous. The largest increase (over 400 per cent) during 1900 to 1905 was in ammoniated superphosphate.

The South Atlantic States lead in both quantity and value of fertilizer products, the North Atlantic States being second, the South Central third, and the North Central fourth.

The amount and value of different kinds of fertilizing materials produced in 1905 as compared with 1900 are shown in the following table:

Amount and value of fertilizing materials produced in the United States, 1900 and 1905.

Kind of fertilizer.	Amount 1905.	Value 1905.	Increase in amount over 1900.	Increase in value over 1900.
	Tons.		*Per cent.*	*Per cent.*
Fish	923,305	$880,142	101	379
Kainit	190,493	1,891,073	248	263
Limestone	20,281	10,731	183	47
Phosphate rock	888,571	4,244,554	13	19
Pyrites	342,962	2,020,759	19	38
Sulphur	4,210	92,234	[a] 67	[a] 66
Lime	[b] 22,131	3,475	69	292
Potash salts	122,107	3,606,701	.....	16
Nitrate of potash	1,160	39,039	31	21
Nitrate of soda	42,213	1,760,432	116	148
Wood ashes	[b] 17,083	2,050	.....	.....
Sulphuric acid	197,865	1,084,304	[a] 14	[a] 20
Superphosphate	320,559	2,912,010	12	34
Ammoniates	125,888	2,445,051	.....	.....
Ammonium sulphate	10,540	600,856	187	222
Common salt	2,406	13,245	400	499
Cotton-seed meal	.....	2,376,448	.....	1,319
Bones, tankage, etc	.....	5,094,149	.....	[a] 48

[a] Decrease. [b] Bushels.

Italy's production of chemical manures, A. Menozzi (*Abs. in Chem. Trade Jour., 43 (1908), No. 1108, p. 152*).—A report presented to the minister of agriculture on this subject is briefly reviewed.

Fertilizers in Australia (*Mark Lane Express, 99 (1908), No. 4023, p. 497*).—Attention is called to the rapid increase in the use of fertilizers in Australia, the imports in 1906 amounting to 150,360 tons valued at about $1,891,500.

Artificial fertilizers in China (*Chem. Trade Jour., 43 (1908), No. 1119, p. 398*).—A brief statement is given as to the extent to which fertilizers are used in China and the possibilities of developing the fertilizer trade there.

Report on commercial fertilizers, 1908, E. H. Jenkins and J. P. Street (*Connecticut State Sta. Rpt. 1907–8, pt. 8, pp. 453–570+VIII*).—Analyses of 632 samples of commercial fertilizers and manurial waste products examined during the year are reported and discussed with reference to variation in composition and commercial value. The fertilizers examined are classified as follows: Containing nitrogen as the chief active ingredient, 185 samples; phosphoric acid, 10 samples; potash, 23 samples; nitrogen and phosphoric acid, 53 samples; mixed fertilizers, 305 samples; and miscellaneous fertilizers and manures, 56 samples.

Inspection and analyses of cotton-seed meal on sale in Mississippi, W. F. Hand et al. (*Mississippi Sta. Bul. 114, pp. 3–35*).—Results of inspection of 414 samples of cotton-seed meal during the season of 1907–8 are summarized. Very few shipments of meal showed marked deficiencies in composition.

Analyses of commercial fertilizers, W. Frear (*Penn. Dept. Agr. Bul. 171, pp. 73*).—This is a report of inspection of fertilizers in the State from January 1 to August 1, 1908, and includes analyses of 625 samples of fertilizing materials.

Fertilizers as sold 1908, A. McGill et al. (*Lab. Inland Rev. Dept. Canada Bul. 161, pp. 23*).—Analyses of 119 samples of fertilizers collected in various districts of Canada are reported. Attention is especially called to the need of improvement in the Canadian fertilizer law with respect particularly to registration and identification of brands.

Manures, H. E. Annett, F. V. Darbishire, and E. J. Russell (*Jour. South-east. Agr. Col. Wye, 1907, No. 16, pp. 183–200*).—This article gives analyses with discussions of the fertilizing value of fish, meat, and other guanos, bone manures, potash salts, nitrate of soda, sulphate of ammonia, rape dust, pond muds, septic tank deposit, seaweeds, greaves, waste products, shoddy, mixed manures, sewage sludges, lime, phosphatic manures, mineral phosphates, superphosphate, and gypsum.

Ohio fertilizer law (*Off. Rpt. Ohio Dept. Agr. on Acreage and Condition of Crops, 1908, pp. 17–20*).—Various amendments of this law which took effect November 1, 1908, are given.

AGRICULTURAL BOTANY.

Solereder's Systematic Anatomy of Dicotyledons, trans. by L. A. Boodle and F. E. Fritsch, revised by D. H. Scott (*Oxford, 1908, vols. 1, pp. XII+644, figs. 153; 2, pp. VI+645–1183, figs. 36*).—After an introduction dealing chiefly with the value of anatomical characters, descriptions are given of the anatomical features of the individual dicotyledonous orders, the arrangement of the latter being the same as in Bentham and Hooker's Genera Plantarum. Under the description of each order, after a short review of the anatomical characters, detailed statements are given as to the structure of the leaf, structure of the axis, etc. Following the detailed descriptions a summary is given of the existing data regarding anatomical characters of plants.

The book, in addition to its value to students of plant anatomy, will be useful to those interested in applied botany, for the determination of raw vegetable products of unknown origin, and also to the physiologist who wishes to obtain information on the anatomy of the plants used in his experiments and on the distribution of certain anatomical features which are connected with special functions.

A text-book of general bacteriology, E. O. Jordan (*Philadelphia and London, 1908, pp. 557, figs. 163*).—This book, which is the outgrowth of a series of lectures given to the students of the University of Chicago, describes the fundamental principles and methods of laboratory work as fully as possible in a publication of its kind, an exhaustive treatise within ordinary limits being impossible. Following a description of methods of studying bacteria, chapters are given in which the biology of bacteria and their relations to organized life are discussed. The morphology, cultural characters, etc., of a number of groups of bacteria that cause disease in man are described at length. Chapters are given on dairy bacteriology, bacteria in the arts and industries, the bacteria of air, soil, and water, bacterial diseases of plants, etc.

A bibliography of mycological literature, G. Lindau and P. Sydow (*Thesaurus litteraturæ mycologicæ et lichenologicæ ratione habita præcipue omnium quæ adhuc scripta sunt de mycologia applicata. Leipsic, 1908, vol. 1, pt. 2, pp. 401–903*).—This publication is a continuation of the previous number (E. S. R., 19, p. 1027), the titles listed being those of authors as far as Lyon. The total number of papers to the conclusion of the present number is 16,142.

International catalogue of scientific literature. M—Botany (*Internat. Cat. Sci. Lit., 6 (1908), pp. VIII+330+843*).—This is an author and subject catalogue of the literature relating to botany, nearly 7,000 titles being listed. The method of treatment is similar to that described before (E. S. R., 20, p. 435). The literature indexed is mainly that of 1906.

The development of the Uredineæ and the origin of new forms, E. Fischer (*Mitt. Naturf. Gesell. Bern, 1907, No. 1629–1664, pp. 136–154*).—The author dis-

cusses the various generations of rusts and the relation of the uredo forms of some species to the other stages occurring in their life histories.

Field, garden, and orchard crops of the Bombay Presidency, G. A. GAMMIE (*Dept. Agr. Bombay Bul. 30, pp. IV+114*).—Botanical diagnoses are given of orders, genera, and species of the field, garden, and orchard crops of the Bombay Presidency, 38 orders of plants being represented. The different orders, genera, and species are described in more or less botanical terms, and economic notes are given on each species and variety.

Seeds and plants imported during the period from January 1 to March 31, 1908. Inventory No. 14 (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 137, pp. 64*).—This is the fourteenth inventory of seeds and plants imported through the Section of Seed and Plant Introduction and embraces 778 items, the introductions received between January 1 and March 31, 1908. Most of these introductions were from China, being a portion of the collection of F. N. Meyer, agricultural explorer.

The germination of some grass seed and a contribution to the study of aleurone grains, A. GUILLIERMOND (*Arch. Anat. Micros., 10 (1908), No. 2, pp. 141–226, pls. 4, figs. 13*).—A cytological study was made of the aleurone grains, and especially of the globoids, of certain grasses, and the author records various phenomena in the germination of seed of barley, wheat, and maize.

The aleurone grains of grasses are formed just as in the lupines from a fundamental mass of proteids by the inclusion of globoids whose number and size vary with the different species. The globoids by their reaction appear to be nitrogenous material and resemble volutin. Aleurone grains are to be found not only in the cotyledons and embryo of the seed but also in certain secretory cells of the epidermis. They are formed in the vacuoles, the globoids first appearing, and around these are deposited the proteids in the form of minute granules. During germination, the aleurone grains are transformed, the proteid granules disappearing first, and the globoids persisting for 5 or 6 days. The globoids are to be considered as reserve material. The epidermal cells of the cotyledons, believed by Brown and Morris to be the seat of diastatic secretion, also contain soluble starch, fat, and aleurone grains.

Chemical processes accompanying the germination of seeds, F. SCURTI and A. PARROZZANI (*Gaz. Chim. Ital., 38 (1908), I, No. 2, pp. 216–227; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 547, II, p. 417*).—A study was made of the proteolytic changes occurring in sunflower seeds, comparisons being made with the nitrogenous compounds found in etiolated shoots of the same seeds The authors identified xanthin, hypoxanthin, arginin, histidin, lysin, and cholin, in addition to which the seeds contained a small proportion of tyrosin. The conclusion is drawn that in so far as the proteids are concerned, natural germination consists of an ordinary proteolysis quite analogous to that produced by the action of the isolated enzyms on the isolated proteins.

In the authors' experiments, no asparagin was formed during the digestion of sunflower seeds, nor during the initial period of their natural germination, although it made its appearance during the more advanced stages of the germinative process. This confirms the view that asparagin is not a direct product of the resolution of proteids, but is a secondary product formed by special transformations at the expense of the primary products.

The production of dry matter and chlorophyll in the higher plants under the influence of different intensities of light, W. LUBIMENKO (*Ann. Sci. Nat. Bot., 9. ser., 7 (1908), No. 3–6, pp. 321–415, figs. 16*).—In previous publications (E. S. R., 19, pp. 831, 930), the author has discussed various phases of his investigations on the relation of light to chlorophyll, and in the present paper a

detailed account is given of his experiments which were carried on with 6 species of herbaceous plants and 8 species of trees.

From the author's conclusions it appears that the production of dry matter by green plants is determined by the energy of the light and varies with the illumination and the amount of chlorophyll in the leaves. The amount of chlorophyll in a given plant varies from time to time, the minimum being associated with full illumination in all the species studied. It increases rapidly with the diminution of illumination up to a maximum, after which there is a gradual diminution if the light is still more reduced. In general the maximum of chlorophyll production corresponds to an illumination considerably below that which induces the formation of the maximum dry weight of plants. The production of dry matter in plants increases with the increased light absorbed up to a certain point, after which it decreases with accompanied greater illumination. The optimum of energy absorbed for a given plant is constant for a given temperature, but diminishes when the temperature is increased.

The optimum intensity of light for the production of dry matter varies according to the quantity of chlorophyll contained in the leaves. Under natural conditions of light the maximum production of dry matter in plants poor in chlorophyll takes place in full sunlight, while on the contrary, with those species rich in green coloring matter the maximum production of dry weight corresponds to a considerable attenuation of light. In general the development of a plant following its illumination is in proportion to the dry matter produced. The growth of the stem and roots seems antagonistic, for while the rate of development of the stem increases with illumination, that of the roots decreases. The development of the leaves is affected in a manner similar to that of the roots.

With few exceptions, transpiration does not appear to have an appreciable effect on the total dry matter produced. The proportion of dry to fresh weight decreases with illumination, and the illumination appears to exert a specific influence upon the water contained in a plant, irrespective of transpiration.

All plants seem to be able to regulate the absorbed light energy and to protect themselves against the unfavorable influence of an excess of light. From a biological standpoint, plants growing in mass are at an advantage regarding an increase in dry matter, since they are able to secure a considerable reduction in the amount of total illumination.

The transpiration of evergreen plants, M. Puglisi (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), 1, No. 10, pp. 661–666*).—From a study made of a number of dicotyledonous plants with persistent foliage, the author found that among the Lauraceæ the energy of transpiration has a well-defined periodicity with a minimum stage during December and January, when cold weather and a minimum of illumination coincide, and an optimum in the spring of the year, when vegetative growth is actively renewed and the surrounding conditions are favorable. The curve of transpiration then decreases through the summer's heat and drought, and at length reaches the winter condition of minimum activity.

With Persea, Oreodaphne, and other plants the energy of transpiration is highest during midsummer, but is not always in proportion to the atmospheric conditions which favor the phenomena of transpiration. With the return of autumn rains, transpiration becomes irregular but finally reaches the level of the early spring condition.

The respiratory pigments of plants, W. Palladin (*Ber. Deut. Bot. Gesell., 26a (1908), No. 2, pp. 125–132; Ztschr. Physiol. Chem., 55 (1908), No. 2, pp. 207–222; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 547, II, pp. 416, 417*).—During the autolysis of germinating wheat, kept under chloroform

water, a chromogen is formed, which oxidizes at the surface of the liquid to a blackish-brown pigment. It is suggested that this pigment is formed from the anaerobic precursors by oxidation with molecular oxygen during respiration, and the name phytohæmatin is proposed for members of this class. According to this view, the process of respiration is primarily anaerobic and results in the production of alcohol and other substances and of carbon dioxid and water. The absorption of oxygen is merely due to a secondary oxidation of some of the products of fission.

The elimination of carbon dioxid from dead plants, A. J. Nabokich (*Ber. Deut. Bot. Gesell., 26a (1908), No. 4, pp. 324–332*).—A study was made of *Penicillium glaucum*, seedlings of *Lupinus luteus*, sunflowers, broad beans, peas, and of the fruiting bodies of *Agaricus campestris*, which showed that under the conditions of the experiment there was a considerable evolution of carbon dioxid when the plants were placed in a vacuum after they had been killed in various ways. This indicates an anaerobic respiration that was entirely independent of bacteria or enzyms.

The relation of the sugar and starch content of guard cells to the opening and closing of stomata, Margery S. Rosing (*Ber. Deut. Bot. Gesell., 26a (1908), No. 6, pp. 438–445*).—A study was made of a number of species of plants to determine whether there is any relation between the starch and sugar content of the guard cells and the opening and closing of the stomata, but while some of the preliminary results seemed to indicate a correlation, there was not sufficient harmony in them to warrant any generalization on the subject.

A study of amylolytic ferments in oats, P. Klempin (*Biochem. Ztschr., 19 (1908), No. 3, pp. 204–213, fig. 1*).—The author made a study of an amylolytic ferment separated from oats, and in the form of glycerin extract its optimum effect was secured in temperatures between 40 and 70° C. It was found able to withstand higher temperatures, 90 to 95° being necessary to render it inactive. Digestion experiments with the ferment showed it to be relatively active.

The relation between phosphorus and the formation of amino acids in the higher plants, F. Scurti (*Staz. Sper. Agr. Ital., 41 (1908), No. 7, pp. 456–470*).—The author reports a correlation between the presence of phosphorus and the formation of proteid substances in plants, and states that the correlation is also extended to amino acids, which are considered a stage in the synthesis of albuminoid materials, phosphorus in all probability having an important function in their formation.

Proteid formation in ripening seed, N. Wassilieff (*Ber. Deut. Bot. Gesell., 26a (1908), No. 7, pp. 454–467*).—A study was made of lupines and some other leguminous plants to determine the source of protein in their fruits and seeds.

When lupine fruits were separated from the plant the formation of proteids was found to continue both in light and darkness, and the increase in protein was accompanied by a decrease in the organic crystallized nitrogenous material in the pods. At first the increase in proteids was made at the expense of the asparagin, but later the synthesis of proteids was at the expense of amido acids, which are formed in darkness more abundantly than in the light. The author believes that the hypothesis that proteids are formed from asparagin is correct. It is thought probable that during the ripening process the amido acids are transformed into asparagin and this substance into protein. The rôle of the organic bases is similar to that of the amido acids, and their content diminishes with the increase of proteids. When the seeds were examined they were found to increase in their protein content with their development, part of the protein being derived from the amido compounds in the seeds themselves and part by translocation from the hulls. Seeds removed from the hulls increased in proteids at the expense of the asparagin and amido compounds.

Some chemical changes in the maturity of fruit, F. Scurti and G. De Plato (*Staz. Sper. Agr. Ital., 41 (1908), No. 7, pp. 435–455*).—A discussion is given of the changes in acidity, sugars, and nitrogenous constituents in oranges during the process of ripening of the fruits, and of the presence of asparagin and glutamin in the juice.

On the occurrence of zinc in plants, M. Javillier (*Thesis, Univ. Paris, 1908; Ann. Inst. Pasteur, 22 (1908), No. 9, pp. 720–727; rev. in Rev. Sci. [Paris], 5. ser., 10 (1908), No. 9, pp. 278, 279*).—In a study of about 45 species representing 27 families of plants, the author found zinc to be of quite common occurrence. The rôle of zinc in the plant was studied, and it is believed to have an important physiological function in the growth of many plants, probably acting as a catalytic agent in some of the more complex fertilizers, its behavior in this respect being similar to that of manganese. When added to cultures in which *Aspergillus niger* was grown, there was a decided increase in the dry weight of the fungus, and zinc appeared to actively stimulate the growth of a number of the vascular plants investigated.

Oleuropéine, a new glucosid isolated from the olive tree, E. Bourquelot and J. Vintilesco (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 7, pp. 303–314*).—The authors have isolated from the olive a glucosid to which they have given the name oleuropéine. It is present in the bark, leaves, and fruit, the proportion varying with the part of the plant and the season of the year. It is most abundant in the young olives when the seed is forming, and it disappears in them toward the period of ripening. The method of isolation and properties of oleuropéine are described at length.

The abnormal development of wound tissues, T. Wulff (*Ark. Bot., 7 (1908), No. 3–4, Art. 14, pp. 32, pls. 7, fig. 1*).—In this article descriptions are given of abnormal callus-like tissues in raspberry canes, due to the development of corky tissues from the cambium layer injured by frost, and a somewhat similar affection the exact cause of which is not known. The primary injury in some cases seems to be due to the punctures of mites or other animal injuries.

Investigations on forest injury due to smoke and gas, Gerlach (*Ztschr. Forst u. Jagdw., 40 (1908), No. 7, pp. 429–437, figs. 2*).—A study has been made of two cases of smoke injury to forests in Germany. The author is convinced that the destruction of fir trees in two forest districts is due to the flue gases given off from some large industrial works. The presence of *Pissodes* spp. is attributed to the injury of the trees by gases. The twigs showed reddish discoloration which indicated gas injury, and analyses of samples of diseased twigs from the two localities showed 0.498 per cent sulphuric acid in 100 parts of dry matter in one instance and 0.465 per cent in the other.

The relation of the conformation of the land to air currents, and hence the direction of smoke dispersal, is discussed.

The injurious effect on plants and soils of flue dust, E. Haselhoff (*Fühling's Landw. Ztg., 57 (1908), No. 18, pp. 609–615*).—A discussion is given of the effect of smoke and fumes from blast furnaces, chemical works, etc., on the growth of various plants, together with data indicating the injury done by the components of smoke and flue dust on beans, rye, and grass. The effect of the accumulation of copper and other substances from chemical works in the soil is also discussed. Analyses, experiments, and observations with various plants are reported indicating that the injurious effect of the dust is due to sulphurous acid.

A registering photometer, E. A. Mitscherlich (*Landw. Vers. Stat., 68 (1908), No. 5–6, pp. 467–469, fig. 1*).—A description is given of a registering photometer which the author claims is especially adapted to experiments in connection with the light requirements of plants and similar work.

FIELD CROPS.

Report of the advisory committee on soil investigation, H. A. McKeene (*Springfield, Ill: State, 1908, pp. 32, dgms. 3*).—An act of the Illinois legislature provides for the investigation and study by the experiment station of the soils of the State, and it further provides that a committee of five, appointed by the State Farmers' Institute, is to advise with the director of the station on the ways and methods by which this investigation shall be conducted. This publication contains a report on the inspection of the soil experiment fields at nine different points in central Illinois, and gives briefly the results secured on the different fields, together with answers by C. G. Hopkins, in charge of the work, to questions by the committee.

Summary of results secured on the experimental field at Ploti in 1907, A. Winkler (*Ghodichnuĭ Otchet Ploty. Setsk. Khoz. Opuitn. Stantziĭ, 13 (1907), pp. 168–174*).—In a comparison of methods of fallowing, the best yields of rye and winter wheat during the dry season of 1907 were secured on black fallow. Spring wheat after timothy gave much smaller yields than after sainfoin, alfalfa, and clover. The yield of wheat after sainfoin was larger than after clover and alfalfa. It was also found that winter wheat after clover gave better results than spring wheat.

The results of experiments with barnyard manure showed that 18,000 kg. per hectare (about 8 tons per acre) were practically as effective as 36,000. The use of superphosphate in quantities furnishing 30 kg. of phosphoric acid per hectare (about 26.7 lbs. per acre) produced an increase in the yield of 240 kg. of grain.

Deep plowing gave better yields of spring wheat, sugar beets, and potatoes than shallow plowing, but corn produced the best crop on shallow plowing with frequent shallow surface cultivation. Determinations of soil moisture 10, 30, 50, 70, and 100 cm. below the surface indicated a lower moisture content in the corn field at a depth of 10 cm. (about 4 in.) than in a wheat field, while at all other depths the moisture content in the corn field was above that in the wheat field.

Report on the Cawnpore agricultural station for the year ending June 30, 1908, J. M. Hayman (*Rpt. Cawnpore [India] Agr. Sta., 1907, pp. 87*).—This report describes the situation, area, and soil of the station and presents the results of experiments with different crops and fertilizers.

The average results of fertilizer tests with corn show that the best yield was obtained where an application of poudrette, furnishing 100 lbs. of nitrogen per acre, was given. The best yield of wheat was secured from an application of sheep dung furnishing 50 lbs. of nitrogen. Cotton gave the best yield where barnyard manure was given in quantities furnishing 50 lbs. of nitrogen per acre and superphosphate in applications supplying 50 lbs. of phosphoric acid per acre. Potatoes led with a yield of 16,500 lbs. per acre on the plat fertilized with neem-cake furnishing 200 lbs. of nitrogen per acre, as compared with poudrette and cotton refuse supplying the same quantity of nitrogen. Hemp proved an effective green-manuring crop for wheat. Selection experiments with cotton are reported and the variations observed through different generations are recorded. Work with rice, leguminous forage crops, cacti, fiber plants, and crop rotations is briefly noted.

Cereal culture on the dry lands of central Tunis, E. Leloup (*Bul. Agr. Algérie et Tunisie, 14 (1908), Nos. 17, pp. 417–428; 18, pp. 441–448*).—This article describes the requirements and methods for dry farming in central Tunis, and gives directions for its improvement. The rainfall of the country for a number of years is tabulated, and it is pointed out that the rainfall alone

is not always sufficient in securing a profitable harvest. In 1898 a good crop was grown with a rainfall of 135 mm., while in 1908 with the same amount of rainfall the crop was an entire failure. In 1903, with a rainfall of 125 mm., and in 1905, with a rainfall of 110 mm., the yields were as satisfactory as in 1898. In 1904, when precipitation amounted to 115 mm. the harvest was poor, and in 1907, with a rainfall of 195 mm. it was very mediocre.

Alopecurus agrestis, C. Fruwirth (*Arb. Deut. Landw. Gesell., 1908, No. 136, pp. 20, pls. 6, figs. 2*).—This publication contains a botanical description of this grass, a discussion of the life of the plant, and notes on its growth requirements, distribution, influence on other crops, and uses.

The basis for judging brewing barley, E. Jalowetz (*Wiener Landw. Ztg., 58 (1908), No. 78, pp. 771–773*).—After discussing the subject and reviewing observations and experimental results with a bearing on the subject, the author concludes that the following points should be considered in judging brewing barley: Color, odor, broken and sprouted grains, sorting according to shape of the kernel, water content, nitrogen content in the sorted and unsorted portions of the quantity examined, the 1,000-kernel weight, fineness of the hull, mealiness or flintiness, germination, and foreign matter.

Comparison of plants of the field beet grown from seeds from the same seed boll, H. Briem (*Fühling's Landw. Ztg., 57 (1908), No. 20, pp. 694–698*).—The weight of the seeds taken from seed bolls containing 4 or 5 seeds are given, and the results of experiments with the different seeds from single seed bolls are reported. The weight of the beet and the sugar content of the same in each case are recorded. The results show in general that the heavier seeds produce the more vigorous and heavier plants.

Corn culture (*Texas Dept. Agr. Bul. 4, pp. 7–116, map 1*).—This bulletin contains a series of papers by different authors on the various phases of corn culture and the uses of the crop.

Experiments on the improvement of cotton by seed selection in the Leeward Islands, F. Watts and H. A. Tempany (*West Indian Bul., 9 (1908), No. 3, pp. 220–233*).—In the experiments reported selection of plants was based on strength and vigor of growth, freedom from disease, and yielding capacity, while the individual seeds were selected for the length, evenness, and strength of fiber. Of 100 plants grown from unselected seed of selected plants, 60 per cent produced a staple 1⅜ to 2 in. in length. Similar selections from high-grade and productive cotton gave in one instance 43 per cent of the fiber from 1⅜ to 2 in. long and 34 per cent of even fiber over 2 in. long. In another test 34 per cent of the fiber produced was over 2 in. long and quite even, while 29 per cent was over 2 in. long and very even. In a cooperative test seed classed under certain grades produced a crop of which 80 per cent came under the same grades as the original seed.

The methods of selection, including the examination of the lint, are described and the results of these and other tests, which in general show the influence of selection, are given in tables.

Hop experiments, A. Amos (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 333–345*).—The results of cooperative fertilizer and culture tests now in progress for a series of years are reported. The fertilizer experiments showed that the hop plant requires a normal mixture of all the elements of plant food and that it is not a special feeder on any one particular element in preference to another. From this it is concluded that the problem of manuring hops narrows down to a study of the soil and to the application of the elements found lacking.

In a culture test a plat given shallow cultivation for 12 years, simply for the purpose of keeping down weeds, produced throughout a crop greater than

the plat receiving deep cultivation each season. A plat given shallow cultivation for only 6 years did not produce as large yields as the one given shallow cultivation for 12 years.

Report from the select committee on the hop industry (*London, 1908, pp. LIV+591, dgms. 2*).—This report contains statistics and tables with regard to the acreage of land devoted to hops in England, the estimated yield per acre, and the total home production, together with similar data for different hop-growing counties of the country. The report further embodies the statements of 42 hop growers, dealers, consumers, and others heard by the committee. It deals mainly with the cultivation of the hop in England, but considerable attention is also devoted to the world's supply of hops and the international trade in the product.

The German hop crop of 1908 (*Allg. Brau. u. Hopfen Ztg., 48 (1908), No. 293, pp. 3159–3162*).—The acreage, average yield, and total yield of hops for the years 1878–1908, inclusive, are tabulated and data concerning the area and yields of the different hop-growing sections of the country in 1908 are reported.

Duty on hops (*San Francisco, Cal. [1908], pp. 20*).—This revised report of a hearing given before the Committee on Ways and Means, with reference to an increase in the duty on hops, includes statistics concerning the crop.

The ixtle and its relations, R. Endlich (*Tropenpflanzer, Beiheft e, 9 (1908), No. 5, pp. 221–283, pl. 1, figs. 6*).—The botanical relationships, culture, and uses of the following species of fiber plants are discussed: *Agave heteracantha*, *A. lophantha*, *A. univittata*, *A. falcata*, *A. striata*, *A. tequilana*, *Samuela carnerosana*, *Hesperaloë funifera*, *Yucca treculeana*, *Y. australis*, *Y. valida*, *Y. schottii*, *Y. elephantipes*, *Y. endlichiana*, and *Y. rostrata*.

The cultivation of ground nuts, H. C. Sampson (*Dept. Agr. Madras, Bul. 58, pp. 145–149*).—This is a popular bulletin on the culture of peanuts in India. The methods of irrigation practiced in connection with the culture of this crop are briefly noted.

Water culture method for experimenting with potatoes, J. J. Skinner (*Plant World, 11 (1908), No. 11, pp. 249–254, figs. 3*).—This article describes in detail the method used for growing potatoes under water culture for experimental purposes.

Commercial potato growing, A. G. Craig (*Washington Sta. Popular Bul. 11, pp. 7*).—This bulletin describes in a popular manner the culture of potatoes under the climatic and soil conditions of Washington. A list of varieties adapted to the State is given and the methods of growing potatoes in the irrigated districts are described.

The cultivation of tobacco in Kentucky and Tennessee, W. H. Scherffius, H. Woosley, and C. A. Mahan (*U. S. Dept. Agr., Farmers' Bul. 343, pp. 31, figs. 13*).—This bulletin gives general directions with reference to growing young tobacco plants in the seed bed, selecting and preparing ground for a tobacco crop, topping the plants, combating insects, selecting seed plants, harvesting, curing, stripping, grading, and marketing. The 4-year rotations and one 8-year rotation, practiced in the tobacco districts of these States, are outlined.

The production of cigar-wrapper tobacco under shade in the Connecticut Valley, J. B. Stewart (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 138, pp. 31, pls. 5*).—A general description of the culture, curing, packing, grading, and marketing of shade-grown tobacco is given, and the improvement of tobacco obtained by seed selection and the value of sterilizing the seed beds are discussed. A detailed account of expenditures connected with the production of 3 acres of shade tobacco in the Connecticut Valley is reported, together with the proceeds from the sale of the tobacco grown.

The results of actual experiments show that tobacco can be produced profitably in the Connecticut Valley under shade if a good strain of seed is secured and proper cultivation and handling of the crop is given. The best cloth to use for shade is one with 12 hard-twisted threads to the inch. This kind of cloth in an experiment produced a higher yield and a better quality of tobacco than cloth which contained only 8 threads to the inch. It has been found in experiments, and subsequently in general practice, that sterilized seed beds insure an abundance of good healthy plants.

Sumatra tobacco: Culture, curing, marketing, E. Mathieu (*Singapore, 1908, pp. 51, figs. 2*).—This publication briefly outlines the history and culture of the tobacco plant in Deli.

The yellow berry problem in Kansas hard winter wheats, H. F. Roberts and G. F. Freeman (*Kansas Sta. Bul. 156, pp. 35, dgm. 1*).—This bulletin reviews the results obtained by other investigators of the yellow berry problem and reports experiments conducted by the authors to determine the causes of this difficulty and means for their removal. The work of the Nebraska Station, partly reviewed here, has been previously noted (E. S. R., 17, p. 246).

By the term "yellow berry" is meant the appearance of grains of a light yellow color, opaque, soft, and starchy in hard winter wheats which normally produce a hard, flinty, translucent grain of medium size and of a clear, dark reddish amber color. Sometimes only a part of the kernel will show the yellow berry characteristics. It is pointed out that the data at hand indicate that the ordinary soft and starchy wheats of the Pacific Coast and the Middle and Southern States average somewhat higher in weight per bushel than the hard winter and spring wheats, and that the yellow berry in this respect does not resemble the soft wheats, the weight as well as the specific gravity falling below the flinty kernels of the same variety. This is considered as reducing the question to what extent the production of yellow berries is inherent in the variety and to what extent it is due to seasonal influences. In 21 varieties examined the average weight of the yellow berries per 100 was 2.596 gm., and that of the hard flinty grains 2.740 gm. The average specific gravity of the yellow berries was 1.304 and of the normal grains 1.336. It is known that the yellow berry contains less protein than the flinty kernel, and it is believed that the reduction in specific gravity is probably due to air cavities within the kernel and possibly to a reduced starch content.

To determine the relation between the amount of yellow berry produced under the climatic conditions of the particular season, 128 varieties of wheat were grown during 1905–6 and 1906–7. The heads were harvested when considered fully ripe and dried under cover, so that the existence of yellow berry could not be attributed to overripeness or exposure to the weather after cutting, but could only be ascribed to the influence of the weather before harvesting the heads or to inherent hereditary tendencies in the varieties themselves, or to both. Only clear kernels with a reddish amber color throughout were considered as normal grains, while those either wholly or in part yellowish, opaque, and starchy were classified as yellow berries.

The mean temperature during the wheat vegetative season, September to June, inclusive, in 1905–6 was 51.33° F., and in 1906–7, 49.10°, while the total precipitation for the corresponding periods was 25.72 and 21.11 in., respectively. The average total vegetative season made up of the fall vegetative period, or the number of days from planting to January 1, and the spring vegetative period, or the number of days from March 1 to maturity, was 267 days in 1906 and 279 days in 1907. The average percentage of yellow berry was 33 in 1906 and 39 in 1907. To interpret the results with regard to the relation of temperature,

light, air movements, and precipitation to the growth of the wheat plant, and the possible share of each factor in the production of yellow berry, was found to be extremely complex and intricate.

Relative to the influences of the autumn vegetative conditions on the production of yellow berry, the data for the 2 years show the same diminution in the percentage of yellow berry with the shortening of the fall vegetative period and a corresponding decline in the mean temperature for that period. The first year the planting season lasted over 19 days (from September 28 to October 16), corresponding with which there was a decrease in the average amount of yellow berry of from 53.80 per cent in the highest to 19.58 per cent in the lowest case. The second year, when the planting season covered a period of but 4 days (September 26–29), there was apparently a correspondingly lower range in the average percentage of yellow berry from the different plantings of from 44.33 per cent in the highest to 32.63 per cent in the lowest. Apparently the reduction in the total length of the growing period with the later plantings, the consequent lower mean temperature for the period of fall growth, and the necessarily retarded and diminished development of the plants is in direct correspondence with the subsequent development of yellow berry, in so far as the data here secured are concerned.

Vegetative spring conditions did not disclose any very definite relationships to the percentage of yellow berry. As the results were sometimes contradictory, and always complex and difficult of interpretation, it was concluded that hereditary tendencies in the varieties themselves might obscure results, and accordingly work was begun to demonstrate whether or not yellow berry is a heritable product.

Among the many cultures of wheats examined, which were planted side by side at the same time and which ripened on the same date, the percentages of yellow berry were found to vary widely. So-called commercial varieties, which were really mixtures of wheats, were grown under identically the same conditions in connection with this investigation. Among them strains of different type were found, which showed distinct physiological differences so far as the production of yellow berry was concerned. The varieties grown in 1906 were grouped into those wheats producing from 1 to 25 per cent, from 26 to 50 per cent, from 51 to 75 per cent, and from 76 to 100 per cent of yellow berry. The crop of 1907 from these groups showed in general that the averages of the amount of yellow berry for each had the same relative position that they occupied in 1906. The minimum range of yellow berry in the varieties lay in those groups of 1907 that came from the minimum groups of 1906. Although the varieties low in yellow berry had progeny in 1907 which averaged 12.25 per cent higher than the average of the corresponding parental groups for 1906, on the other hand the varieties high in yellow berry had progeny which averaged 27.41 per cent lower than the average of the corresponding parental groups for 1906. It was further found that the progeny from selected hard kernels from 8 apparently pure varieties planted in 1906 were much heavier than those from soft grains, and that as a rule the yields from the heavy hard grains were greater than those from the softer kernels.

The degree of inheritance of yellow berry in pure bred or pedigree wheats is discussed, and the results secured in work along that line are reported. In the first progeny group of the pedigree wheats in 1907 a little over one-third produced no yellow berry at all, and the average of all was but 3.9 per cent, whereas in the selections of spikes from the common commercial varieties, as well as in the selections of hard and soft grains from these varieties, there were no cases whatever where the offspring were free from yellow berry. The averages for the lowest groups in the case of the common commercial varieties

and of the selected hard and soft grains from the commercial varieties were 36.95 and 15.40 per cent, respectively.

It appears in general from the results that with the percentage increase of yellow berry in the parents a mean percentage increase of yellow berry in the offspring was observed, and it is considered as very evident that the pedigree culture method, so far as the elimination of the yellow berry is concerned, is superior to the other methods tried. The common commercial variety lots of parents all contained yellow berry, but there were 61 cases (46 per cent) in which the percentage ranged from 1 to 25. The progeny of these in 1907 showed a mean percentage of yellow berry of nearly 37, but among the pedigree cultures there were 38, or 36 per cent, which as parents fell into the 1 to 25 per cent class, but which in 1907 showed a mean percentage of yellow berry of only 7.9. The minimum or zero class of parents gave rise also to the minimum class of the offspring in the case of the pedigree wheats.

[Irrigation experiments with wheat, 1907–8], W. B. Gordon (*Punjab Irrig. Branch Papers, No. II, pt. 3 C, pp. 19*).—The results of these experiments, which were carried on in different parts of the country, show that in a dry year as a general rule four or five normal to heavy applications of water are required for a full yield. At one point, Guara, lighter waterings gave the best results, and at Lyallpur two good and well-timed applications were sufficient to produce almost a full crop. At Guara this result is ascribed to the high level of soil water in the spring, but the cause for the variation at Lyallpur is not known.

Varieties of wheat grown in the Central Provinces and Berar, G. Evans (*Dept. Agr. Cent. Prov. and Berar [India Bul.], pp. 29, pls. 2, map 1*).—Descriptions, together with the classification, of the different varieties of wheat grown in these provinces are given. Figures are presented on the estimated area in wheat for the years 1867 to 1907, inclusive.

The wheat of Tomsk, Siberia, C. Flaksberger (*Trudui Byuro Prikl. Bot., 1 (1908), No. 7–8, pp. 213–221*).—Botanical descriptions of varieties of *Triticum vulgare*, *T. compactum*, *T. turgidum*, and *T. durum* grown in the government of Tomsk are given, and the varieties grown in each of the 7 provinces of this government are pointed out.

HORTICULTURE.

The modern kitchen garden, V. A. Gressent (*Le Potager Moderne. Paris, 1907, 10. ed., pp. 936, figs. 176*).—A treatise on the intensive and extensive culture of vegetables in the various climatic sections of France. The aim of this work, which first appeared in 1864, is to furnish a practical knowledge of vegetable growing to the general public and institutions of various kinds rather than to serve as a guide to the professional market gardener.

Cabbages and cauliflowers: How to grow them, J. J. H. Gregory (*Boston, 1908, pp. 93, figs. 21*).—This is a revised edition of the author's practical treatise on growing, storing, and marketing cabbage. It also includes information relative to varieties, raising cabbage seed, originating new varieties, and cultural notes on other prominent members of the Brassica family, including cauliflower, broccoli, Brussels sprouts, kale, and sea kale.

The citron crop, A. S. Cheney (*Mo. Consular and Trade Rpts. [U. S.], 1909, No. 340, pp. 97, 98*).—Data are given on the production of citrons in the Mediterranean countries, together with a description of the method of preserving citrons in brine for future delivery. The estimated world's production of citrons for the season of 1908–9 is about 8,000 tons.

Mushrooms propagated from spores, M. C. Cooke (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 219–221, fig. 1*).—In view of the general failure

resulting from attempts to propagate mushrooms by spores, the author cites two instances in which the species *Agaricus elvcusis* was propagated from fragments thrown away on the naked soil and continued to flourish for many years. It is suggested that this species may prove of value to mushroom growers.

Inheritance in tomato hybrids, H. L. Price and A. W. Drinkard, Jr. (*Virginia Sta. Bul. 177, pp. 17–53, pls. 10, figs. 5*).—The experiments discussed in this bulletin were undertaken primarily for the purpose of testing for tomato characteristics Mendel's law of inheritance (E. S. R., 13, p. 744).

The work was begun in the spring of 1906, and the main problem consisted in determining what form of inheritance existed for each particular pair of characteristics. The plan as outlined included 21 distinct crosses, many of which differed with respect to more than one pair of character units. All character unit crosses of similar nature, regardless of parentage, are grouped together in a single series and discussed. The fruit characters studied include those having to do with shape, color, number of cells, pubescency, and smoothness. Of the plant characters, the potato leaf was compared with a normal cut leaf, green foliage with yellow foliage, and dwarf stature with standard stature.

From the data obtained the authors conclude that most character units for tomatoes when hybridized exhibit in the first hybrid generation the phenomenon of dominance and recessiveness, and are subject in the second hybrid generation to Mendelian splitting or segregation. These character units are independent in heredity, without respect to parentage. Reciprocal character unit crosses give similar results in the offspring. A list is given of 13 dominant and recessive unit character pairs as determined for the tomato. Certain individual crosses are discussed from the standpoint of di- and tri-hybrids as bearing upon their utility in the development of new varieties. The authors conclude relative to character unit polyhybrids that the different character units are usually independently heritable, and that the re-combinations of characters occurring in the second generation of hybrids conform with Mendel's law for polyhybrids. Extracted recessives and selected homozygous dominants breed true in subsequent generations. Inter- and intra-specific crosses of tomatoes gave similar results in the hybrids.

Of many desirable hybrids incidentally secured in this investigation the following are described: Beauty-Stone, Beauty-Golden Queen, and Potato Leaf-Red Currant.

On the influence of direct light on the chemical composition of fruits, G. Rivière and G. Bailhache (*Jour. Soc. Nat. Hort. France, 4. ser., 9 (1908), Nor., pp. 627–630*).—Analyses were made of the chemical composition of several varieties of pears, the sun-colored side of each specimen being compared with the unexposed side. In all cases the side of the fruit exposed to the sun showed a greater sugar content and a smaller acid content than the unexposed side.

Similar analyses are given for the Chasselas doré grape, in which comparisons were made between the colored and uncolored portions of the same berries, and between colored and uncolored berries taken from different bunches. The results confirm those secured with the pears.

California fruits and how to grow them, E. J. Wickson (*San Francisco, Cal., 1909, 4. ed., rev., pp. 433, pls. 25, figs. 228*).—This is the fourth edition of the author's work on fruit growing in California. The work has been enlarged and revised to embody the results of recent experience, observation, and research and is offered as a manual of methods which have yielded the greatest success, with lists of varieties best adapted to different districts of the State. The fruits discussed include deciduous and semitropical orchard fruits, grapes,

small fruits, and nuts. Consideration is also given to fruit preservation and protection and the utilization of fruit wastes.

Varieties of fruit for growing in North Carolina, W. N. Hutt and S. B. Shaw (*Bul. N. C. Dept. Agr., 29 (1908), No. 9, pp. 3–32*).—This is a popular bulletin containing lists of orchard and small fruits recommended for growing in the mountain, Piedmont, and coast regions of North Carolina. The lists were prepared especially to encourage commercial fruit culture, hence do not contain all of the varieties which will grow in the State. Each variety recommended is described relative to its characteristics and habits.

Fruit culture in Crimea, J. Barsaq (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 11, pp. 1348–1368*).—An account of the development and present status of the fruit industry in Crimea.

Nova Scotia apple industry (*Daily Consular and Trade Rpts. [U. S.], 1909, No. 3375, pp. 1–4*).—According to this consular report the apple industry in Nova Scotia has increased as indicated by the exports from 41,785 bbls. in 1880–1 to about 600,000 bbls. during the present season. Brief notes are given relative to handling the crop, varieties, evaporation process, location of factories, and extent of operations. Apple growing in Nova Scotia is confined to the Annapolis valley, a district about 100 miles long and ranging from 6 to 10 miles in width.

Dessert cherries in pots, J. Hudson (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 189–192*).—Brief practical directions are given for growing cherries in pots, together with a list of varieties best suited for forcing purposes.

A study of the biology and phylogeny of the fig (Ficus carica), and the classification of the figs of southern Italy, G. Celi (*Atti R. Ist. Incoragg. Napoli, 6. ser., 59 (1907), pp. 541–654, figs. 10*).—The author reviews the work of previous investigators relative to the life history, morphology and classification of the various races of the common fig (*F. carica*), and proposes new systems of classification both for domestic figs and capri figs. Sample schemes are given for the classification of the figs grown in southern Italy. An extensive bibliography of the fig is appended.

Notes on fig cultivation in southern India and peculiarities in viticulture in Penukonda in the Anantapur District, C. K. Subba Rao (*Dept. Agr. Madras Bul. 57, pp. 135–143*).—In addition to the notes on fig culture some unusual methods of pruning and treating grapevines are described.

On a process of forcing grapes, M. G. Bonnier (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 8, pp. 653–657*).—The author gives an account of an experiment conducted by L. Pauchet in forcing grapes by causing vines to absorb a sugar solution. The method of procedure is described in detail. The grapes on the treated vines were 12 to 18 days earlier than on the untreated vines. It is believed that this method can be applied to advantage in forcing greenhouse grapes.

Commercial fertilizer experiments with grapevines, E. Zacharewicz (*Rev. Vit., 30 (1908), No. 785, pp. 746–751*).—The author continued for the season of 1908 his comparison of nonnitrogenous and nitrogenous fertilizers for grapes, with results which confirm those reported for previous years (E. S. R., 19, p. 946).

Annual report of the wine-making station of Haro for 1907, V. C. M. de Zúñiga (*Estación Enológica de Haro. Memoria Correspondiente al Año 1907. Haro, 1908, pp. 85, chart 1*).—This is a progress report on the work of the station for the year, including laboratory and field investigations, and is similar in character to that noted for the previous year (E. S. R., 19, p. 648).

Storage and transportation investigations with citrus fruits and grapes, A. V. Stubenrauch (*Ice and Refrig., 36 (1909), No. 1, pp. 8, 9*).—In the investigation reported, conducted by this Department during the summer of 1908, on the behavior of California Valencia oranges stored at different stages of maturity and held for different lengths of time at both 32° F. and at 40 to 42°, the oranges held in cold storage at these temperatures began to deteriorate from a month to 6 weeks after they were put in storage. Both the appearance and eating quality of the fruit were affected. The deterioration was slower and less marked, however, at the higher temperatures than at 32°. The fruit was affected by various skin troubles, the nature of which has not been determined, but which are believed to be connected with low temperatures in storage, since some lots of fruit held in cellar storage at about 60 to 65° showed no trace of these diseases.

Similar preliminary experiments in the cold storage of lemons showed that the fruit stored at 40 to 42° held in better condition longer than that stored at 32°, and indicated that when lemons are handled properly they will keep for a long time when held in common storage at ordinary temperatures.

Tabular data are given showing the results of 2 years' experience in the cold storage of table grapes in California. It was found possible to hold the grapes from 65 to 100 days in excellent condition when packed in fine ground cork, whereas similar fruit packed in the ordinary commercial way held but from 10 to 20 days. Shipping experiments with table grapes showed that the grapes rot least in transit and after arrival when the fruit has been picked and packed with great care and is shipped quickly after packing. The shipping quality of the grapes is improved by packing in cork dust, but tests made of various substitutes for cork dust indicate that redwood sawdust will prove entirely satisfactory. The results as a whole indicate, as in the previous work with citrus fruits (E. S. R., 20, p. 43), that much of the loss arising during storage and transportation is due primarily to improper methods of preparing the fruit for shipment.

The decay of Florida oranges while in transit and on the market, L. S. Tenny, G. W. Hosford, and H. M. White (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 19, pp. 8, figs. 2*).—During the season of 1906–7, the Bureau of Plant Industry commenced an investigation of the cause of decay in oranges shipped from Florida similar in nature to the investigation recently reported on California oranges (E. S. R., 20, p. 43). This circular summarizes the results secured for the past 2 seasons. So far as the investigation has gone the results appear to confirm those secured in California, and show that the decay of oranges is closely connected with rough methods of handling the fruit in the groves and packing houses. Numerous details of grove, packing-house, and transportation methods are to be given further attention.

Orange trees for Texas, H. M. Stringfellow (*Texas Farm and Ranch, 28 (1909), No. 2, pp. 10–12*).—The author discusses the possibilities of orange culture in south Texas, as indicated by past experience. It appears that this section has been visited by killing freezes of short duration at irregular intervals several years apart. Among the methods suggested for the protection of tree trunks the author advocates the trial of sheet asbestos to be wrapped around the trunk of the tree. The circulation of air from beneath the wrapping is prevented by drawing a small amount of earth around the bottom and stuffing a little cotton between the tree and the wrapping at the upper end.

A B C of lime cultivation, J. Jones et al. (*Imp. Dept. Agr. West Indies Pamphlet 53, 1908, pp. 48*).—This pamphlet is of a popular nature containing instructions on the various details of lime culture and the preparation for market of green and pickled limes, raw and concentrated lime juice, citrate of

lime, and hand-pressed and distilled lime oil. Brief trade notes relative to the future of the citrate of lime industry, notes on lime culture in Montserrat, and tables showing the exports of lime products from Dominica and Montserrat for the years 1892–1907, inclusive, together with a brief bibliography of available literature on the lime tree and its products, are appended.

Coffee in the State of São Paulo (Brazil), A. Lalière (*Le Café dans l'Etat de Saint-Paul (Brésil). Anvers, 1909, pp. 415, pls. 93, dgms. 5, maps 3; rev. in Ann. Gembloux, 19 (1909), No. 1, p. 50*).—The author discusses the statistics of coffee production in Brazil and elsewhere and gives a detailed account of the culture of coffee in São Paulo. The processes for preparing commercial coffee are also discussed, together with the economic factors of production, commerce, and valorization.

The fermentation of cacao and of coffee, O. Loew (*Philippine Agr. Rev. [English Ed.], 1 (1908), No. 9, pp. 351–364, pls. 2*).—This is a reprint of the author's report on this subject (E. S. R., 20, p. 45).

The future of cacao planting, H. H. Smith (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 193–218*).—This lecture, together with some supplementary notes on cacao culture, has been noted from another source (E. S. R., 20, p. 540).

Report of the inspector of cocoanut trees, Department of Agriculture, for the year 1907, L. C. Brown (*Agr. Bul. Straits and Fed. Malay States, 7 (1908), No. 12, pp. 590–596*).—The area planted to cocoanut trees in the different Malay states at the end of the year 1907 is estimated at approximately 112,500 acres, or an increase of more than 7 per cent over the previous year. Notes are given on the condition of the plantations, including areas, planting and cultural operations, the production of oil and copra, prices received, etc.

All about cinnamon, A. M. and J. Ferguson (*Colombo, Ceylon [1908], pp. 43*).—This pamphlet contains considerable information compiled from various sources relative to the history and botany of cinnamon, the importance of the cinnamon industry in Ceylon and elsewhere, cultivation and preparation for market, cinnamon substitutes, analysis of cinnamon and cassia oils, etc.

Course on care of trees, G. H. Allen (*Boston, [1908], pp. 45*).—This pamphlet presents a general discussion of the life and growth of trees, together with popular descriptions of the more common trees and methods of planting, pruning, tree surgery, and bolting. The common injuries of trees and their control are also discussed.

Buying nursery stock (*Wis. Hort. Soc. Bul. 14, pp. 3–23*).—This popular bulletin contains suggestions relative to the purchase and selection of nursery stock, together with lists of fruits and flowering and ornamental plants for culture in Wisconsin, and a statement of the aims and purposes of the Wisconsin State Horticultural Society.

The best climbers south and north, P. J. Berckmans (*Gard. Mag. [N. Y.], 8 (1908), No. 6, pp. 273–275, figs. 5*).—A popular discussion of the important characteristics and value for garden purposes of a large number of evergreen and deciduous vines.

Violet culture at Hyers and in the Mediterranean region, J. Foussat (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), Nos. 46, pp. 582–591, figs. 5; 47, pp. 621–628, figs. 4; Prog. Agr. et Vit., 25 (1908), No. 48, pp. 653–662, figs. 7*).—A detailed account is given of the culture of violets in the above-named regions, both for cut flowers and for the manufacture of perfume.

Manual of floriculture, P. L. de Vilmorin (*Manuel de Floriculture. Paris, 1908, pp. VIII+410, figs. 324*).—The purpose of this work is to meet the needs of the amateur in his desire to raise a few flowers in the house or garden. Part 1 deals with the general principles of gardening, and part 2 contains an alphabetical and descriptive list of the more interesting plants, which are also

for the most part illustrated. For details of culture, except in special cases, cross references are made to part 3, which contains lists of plants grouped together according to their treatment. The work concludes with a list of the principal species classed by colors and flowering seasons.

Gardening in California, landscape and flower, J. McLaren (*San Francisco, 1909, pp. XIII+399, pls. 29, figs. 114, dyms. 9*).—This handbook was prepared with special reference to California conditions, and is submitted to amateur and professional gardeners of that State as supplementary to authoritative treatises and encyclopedias on landscape and flower gardening. The first 6 chapters deal with the location of site for house and garden, planning and planting operations, lawn making, etc. In several succeeding chapters popular descriptions and cultural notes are given of a large number of trees and shrubs, climbers and twiners, bulbous and tuberous rooted plants, palms, ferns, bamboos, grasses, succulents, and herbaceous and bedding plants. Other chapters deal with the development of ponds, lakes, and the water garden, parlor gardening, the window box, the amateur's conservatory, diseases and insects injurious to plants, general cultural notes, and sand reclamation. The work concludes with a calendar of operations for the year.

Scottish gardens, H. Maxwell (*New York and London, 1908, pp. X+252, pls. 32*).—In this popular work illustrations and descriptions are given of a representative selection of different types of old and new Scottish gardens. The colored illustrations, by Miss M. G. W. Wilson, are a prominent feature of the book which is presented with a view of stimulating an interest in garden development. Lists are appended of rhododendrons suitable to the climate of the west of Scotland, together with other shrubs which have proved hardy in Scotland and decorative shrubs, herbs, and bulbs.

Some continental gardens and nurseries, W. J. Bean (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1908, No. 9, pp. 387–406*).—Brief descriptive notes are given of several gardens and nurseries in Europe relative to the more interesting trees and shrubs growing there and the general landscape effects of the gardens.

FORESTRY.

Report on forestry, L. A. Thurston (*Hawaii. Planters' Mo., 27 (1908), No. 11, pp. 466–471*).—A review of forest conditions and operations in Hawaii presented before the Hawaiian Sugar Planters' Association.

In connection with the report an account is given of an experiment by L. von Tempsky in planting trees on cultivated versus uncultivated land. A 1-acre lot was planted to eucalypts by merely digging holes and planting 6 ft. each way, whereas a 3-acre lot was plowed and harrowed twice and thoroughly cleaned from weeds before planting. A crop of potatoes was also harvested from the 3-acre lot. Deducting the value of the potatoes which netted $69.19, the cost per acre of growing the trees on the cultivated land was $25.90 as against $18.40 for the uncultivated acre. One year from planting, however, the tallest tree in the uncultivated lot was 5 ft. 3 in. and the average height of the trees 3 ft., whereas on the cultivated lot the tallest tree measured 16 ft. and the average height was over 10 ft. These results appear to warrant systematic cultivation of the tree plantations in Hawaii wherever the location will render it possible.

Report of the superintendent of forestry, R. S. Hosmer (*Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 4 (1907), pp. 9–46*).—This is a report on the operations in the division of forestry for 1907 relative to the establishment and management of forest reserves, forest extension and miscellaneous forest work. Brief statements are included from many of the district foresters relative to

the work under their charge. Notes are also given on the forest fire service and Hawaiian forestry in general, together with an outline of future work.

One new forest reserve was added during the year, making a total of 13 reserves with a combined area of 397,687 acres of which 252,818 are Government land. The data of importance relative to these reserves are given in tabular form.

Report of the forest nurseryman, D. HAUGHS (*Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 4 (1907), pp. 47–54*).—This is a progress report on operations at the Government Nursery, the Nuuanu Station, and the Tantalus Forest for the year ending December 31, 1907, in continuation of lines of work previously noted (E. S. R., 18, p. 1050).

Schedule for forest description (*Forestry Quart., 6 (1908), No. 4, pp. 370–382*).—This is a full translation of an elaborate schedule of forest description compiled by Albert and Schwappach at the instance of the Association of German Experiment Stations, and with a view of securing uniform usage. The principal divisions under the description of site are location, climate, and soil, which are again redivided into many subdivisions and sections. The principal divisions under the description of stand are species, management forms or systems, origin, age, density, condition of stand and numerical data.

Particular attention is called to the soil description, especially the section on humus and peat soils, which is based upon the new classification by Potonié. Suggestions are invited in the article as to improvements in nomenclature for use in this country.

The basket willow, W. F. HUBBARD (*U. S. Dept. Agr., Farmers' Bul. 341, pp. 45, figs. 23*).—This is a condensation and revision of Bulletin 46 of the Forest Service of this Department (E. S. R., 16, p. 161). The important phases discussed are the distribution and characteristics of the willow, its present culture in America, suggestions for improvement in culture, expenditure and returns in American willow culture, systems of peeling, outline of the field experiments of the Forest Service, and varieties of willows for growing in America. An account is also given of the manufacture of willow ware in the United States, together with suggestions for basket makers. The bulletin concludes with a summary statement by C. D. Mell of the essential considerations pertaining to the basket willow industry.

Observations on the culture of Juglans nigra and Carya alba, SCHWAPPACH (*Ztschr. Forst. u. Jagdw., 40 (1908), No. 12, pp. 772–776*).—Data are given showing the growth of the black walnut and shellbark hickory in certain experimental plantations in Germany. It is believed that both of these trees are worthy of greater attention than has been given them in the past.

The silva of Colorado. II, The poplars, aspens, and cottonwoods, F. RAMALEY (*Univ. Colo. Studies, 4 (1907), No. 3, pp. 187–197, figs. 6*).—This is the second of a series of papers dealing with the trees and shrubs of Colorado. The poplars, aspens, and cottonwoods are here treated in a manner similar to the pine family in the paper previously noted (E. S. R., 19, p. 148).

Some rare or otherwise interesting trees recently observed in the western parts of Georgia, R. M. HARPER (*South. Woodlands, 2 (1908), No. 5, pp. 96–100*).—Descriptive notes are given of several trees recently observed in Georgia. The list of trees discussed is considered as supplementary to the catalogue of Georgia trees previously noted (E. S. R., 20, p. 339).

Forestry: Some practical notes on forestry suitable for New South Wales. Conifers, J. H. MAIDEN (*Dept. Agr. N. S. Wales, Misc. Pub. 1072, pp. 82, figs. 26*).—It is the purpose of the author to publish lists of plants suitable for cultivation in New South Wales, and the present publication contains a classified list of those coniferæ which it is believed will flourish in some part of that country.

Brief practical notes are given on their habitats, leading characteristics, present occurrence, and probable value in New South Wales.

Contribution to the knowledge of some timbers of the Eritrea Colony, L. SENNI (*Bol. R. Orto Bot. Palermo, 7 (1908), No. 1–3, pp. 37–58*).—Brief notes are given on the structure and other characteristics of the woods of several timber trees found in the Eritrea Colony, Africa.

An analysis of Canada's timber wealth, B. E. FERNOW (*Forestry Quart., 6 (1908), No. 4, pp. 337–353, figs. 6, maps 2*).—A preliminary survey of forest conditions, forest types, and timber areas in the Dominion of Canada, with estimates of the standing timber in the different provinces. The study is based partially upon the information available, but largely on a study of the geological and climatic conditions which predicate forest types and forest conditions. The author estimates the present supply of timber in the eastern provinces, under prevailing methods of lumbering, as 300,000,000,000 ft. and for the whole of Canada 600,000,000,000 ft., although it is believed that this estimate could be conservatively doubled with a closer utilization accompanied by adequate fire protection.

A compilation of the meager reports on timber conditions in northern Canada has been prepared by R. E. Young, Canadian Department of Interior, Ottawa, and as far as practicable the results have been mapped. By special arrangement this map accompanies the present article. The important features shown are the poor scattered timber, the fairly wooded and thickly wooded areas, the brule, the prairie, and the bare or treeless lands.

Wood preservation by the open-tank process, E. F. HARTMANN (*Engin. News, 60 (1908), No. 27, pp. 740–742, figs. 14*).—This is a general discussion of the subject of wood preservation with special reference to the open-tank process (E. S. R., 19, p. 150). Descriptions and illustrations are given of several open-tank systems in operation in this country.

Experiments in tapping Ceara rubber trees, E. V. WILCOX (*Hawaii. Forester and Agr., 5 (1908), No. 12, pp. 318–320, fig. 1*).—A brief summary of the rubber experiments which are being carried on by the Hawaii Station and the Territorial Board of Agriculture and Forestry in cooperation with private rubber-planting interests. The results obtained thus far in the experiments appear to indicate clearly that the Ceara rubber tree in Hawaii will not only grow and thrive but will also yield profitable returns. Further experiments will include tests of various tapping methods and trials of various species of rubber. A series of fertilizer experiments is also planned.

Report on the cultivation of rubber in Ceylon and the Federated Malay States and Johore, F. T. P. WATERHOUSE (*Hawaii. Forester and Agr., 5 (1908), No. 11, pp. 249–304, figs. 32*).—This is a report to the Hawaiian Board of Agriculture and Forestry and the Hawaiian Rubber Growers' Association, upon the status of the rubber industry in the above-named countries, together with the climatic and soil conditions, and the methods of planting, cultivation, tapping, and treatment of rubber in use. The various phases of the report are illustrated.

The rubber industry in the territories of Manica and Sofala, W. H. JOHNSON (*London, 1908, pp. 39*).—This is a report on the source, collection, and preparation of wild rubber, together with the present status of the rubber planting and experimental tapping operations in the above territories. The author concludes that, although Ceara rubber satisfactory in quality and value can be produced in Portuguese East Africa, it still remains to be determined whether the use of improved methods of tapping will increase the yield of rubber to the remunerative point.

On the rubber extracted from the latex of Euforbia candelabro, O. REBUFFAT (*Atti R. Ist. Incoragg. Napoli, 6. ser., 59 (1907), p. 89*).—According to analyses made by the author, the latex of *Euforbia candelabro*, which plant grows abundantly in Eritrea, Africa, contains from 40 to 50 per cent of dry rubber which compares favorably in quality with the best grades.

Packing Para rubber seed for export, T. W. MAIN (*Agr. Bul. Straits and Fed. Malay States, 7 (1908), No. 11, pp. 548, 549*).—The Botanic Gardens at Singapore have been highly successful in exporting large quantities of Para rubber seed packed in burnt rice husk. A layer of burnt rice husk is put in the bottom of a tin box and alternate layers of seed and husk are added until the box is full. The rice husk is slightly moistened before packing to keep the seeds in a fresh state. The box is not soldered for fear of excessive moisture collecting inside.

Of 10,800 Para seeds packed in this manner and shipped to British Guiana, 64.4 per cent germinated after being packed a little over 53 days. A much larger similar shipment later on gave a germination of approximately 80 per cent.

DISEASES OF PLANTS.

Report on economic mycology, E. S. SALMON (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 267–332, pls. 23*).—Notes are given on the gooseberry mildew (*Sphærotheca mors-uvæ*), brown rot of cherries (*Sclerotinia fructigena*), cherry leaf scorch (*Gnomonia erythrostoma*), apple scab (*Fusicladium dendriticum*), crown gall of alfalfa (*Urophlyctis alfalfæ*), and other diseases. The effect of the different fungi on the host plants is described, and, so far as known, preventive treatments are recommended.

In connection with the alfalfa disease, the author states that the disease was first observed in England in 1906. Experiments were carried on in which a number of badly diseased alfalfa plants covered with galls were obtained from the locality where the disease was first noticed, and these galls were kept dry in the laboratory through the winter. Later a number of the galls were soaked in water and ground in a mortar, and this material used for inoculating well-grown potted plants of alfalfa, beets, mangels, and potatoes. Control pots were kept of each kind of plant by the side of the inoculated ones. The test plants were inoculated twice during the season, first when the growth was beginning to be active and later when the plants had attained full growth for the season. In November, when all the plants were examined, 5 out of 6 of the inoculated alfalfa plants were infested with galls, and in 2 cases the attack of the fungus had been so active as to destroy the plants. No formation of galls was observed on the control plants, or on the inoculated or control plants of mangels, beets, or potatoes.

The report concludes with a discussion on the occurrence of the gooseberry mildew (*S. mors-uvæ*) in England and the need for legislation to prevent its spread.

On the occurrence of diseases and insect injuries on cultivated plants in 1907, R. SCHANDER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 1 (1908), No. 1, pp. 122, pls. 5, figs. 10, maps 2*).—Descriptive notes are given on the diseases and insect injuries observed on cultivated plants in Posen and West Prussia during 1907, the data being grouped according to the host plants, as cereals, root crops, forage plants, orchard and small fruits, vegetables, and forest plants. In addition to fungus and insect pests and their injuries, the author describes the injurious action of various meteorological phenomena, paying particular attention to the injury following the wintering of cereals.

Troubles of alfalfa in New York, F. C. Stewart, G. T. French, and J. K. Wilson (*New York State Sta. Bul. 305, pp. 333–416, pls. 12, fig. 1*).—This bulletin gives an account of the various hindrances to the successful culture of alfalfa in New York, special attention being given to dodder, fungus diseases, and the impurities and adulteration of seed.

Among the more serious troubles, aside from impure seed and improper soil, are dodder and the leaf spot. Dodder may be prevented to a considerable extent by thoroughly sifting the alfalfa seed before sowing. Apparently the dodder seldom ripens its seed in New York. Moreover, it is found to be a perennial and not an annual plant, as generally believed. Where dodder has become well established, the infested areas should be cut over and burned and the crowns of the plants cut off and destroyed. After this is thoroughly done, the area may be reseeded with clean seed without much probability of reinfestation.

Among the fungus diseases noted, the leaf spot (*Pseudopeziza medicaginis*) is the most troublesome and is, in fact, practically the only fungus disease of real importance. The appearance of the fungus, methods of dissemination, etc., are described, and suggestions given for its control. The only practicable method known is mowing the plants, but if close mowing is followed by a period of dry weather the plants suffer severely. When the disease makes its appearance shortly before the hay crop is ready to harvest it is advised that the plants be cut early to avoid the loss of leaves, which is sure to follow if cutting is delayed.

Among other diseases described are wilt (*Sclerotinia libertiana*), anthracnose (*Colletotrichum trifolii*), root rot and damping off (*Rhizoctonia* sp. and *Pythium debaryanum*), downy mildew (*Peronospora trifoliorum*), Ascochyta leaf spot (*Ascochyta* sp.), Stagonospora leaf spot (*S. carpathica*(?)), Cercospora leaf spot (*C. medicaginis*), Alternaria disease of seed, and frost blisters on alfalfa leaves. Alfalfa is sometimes attacked by nematodes (*Heterodera radicicola*), causing the root knot. A number of diseases of unknown cause are briefly described.

A bibliography of more than 100 titles concludes the bulletin.

Alfalfa troubles, F. H. Hall (*New York State Sta. Bul. 305, popular ed., pp. 3–16, figs. 2*).—This is a popular edition of the above bulletin.

A new smut on Bromus secalinus, P. Magnus (*Hedwigia, 48 (1908), No. 3, pp. 145, 146, fig. 1*).—A technical description is given of *Tilletia belgradensis*, a parasite of *B. secalinus*, which the author thinks is specifically different from *T. caries*. The new species is believed to be widely disseminated in eastern Europe and Asia.

Dry rot of potato tubers, G. H. Pethybridge and E. H. Bowers (*Econ. Proc. Roy. Dublin Soc., 1 (1908), No. 14, pp. 547–558, pl. 1; abs. in Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 282, 283*).—A description is given of a dry rot of potato tubers. The authors have come to the conclusion that it is due to *Fusarium solani*, acting independently of any other organism, and that the fungus is a true parasite. Many of the tubers attacked failed to produce plants when used as sets, and others became shriveled to dry hard masses when kept in storage.

The results of numerous experiments with this fungus are given, and it is recommended as preventive measures that all suspicious-looking tubers should be rejected when the crop is dug and not stored. Stored potatoes should be examined from time to time and all affected tubers removed. Care should be taken to prevent wounding during the lifting and handling of the crop. No wounded tubers should be stored, and storehouses should be disinfected from time to time.

Potato rot, I. B. P. Evans (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 64, 65, pl. 1*).—A description is given of potato rot due to *Nectria solani* and the statement made that large quantities of seed potatoes consigned to the Transvaal from France and Germany were found to be affected by this fungus. Experiments carried on at the Botanical Experiment Station, Pretoria, showed that the disease was readily communicated through the planting of diseased tubers, and precautionary measures are suggested for its control.

The fruit spot of apples, C. Brooks (*New Hampshire Sta. Sci. Contrib. 2, pp. 423–456, pls. 7, figs. 2; Bul. Torrey Bot. Club, 35 (1908), No. 9, pp. 423–456, pls. 7, figs. 2*).—As a result of studies, the author reports two distinct fruit spots that occur on New Hampshire apples.

The first, to which he gives the name fruit pit, is characterized by numerous sunken areas from 2 to 6 mm. in diameter on the surface of the apple. These depressions are somewhat hemispherical in shape and have the appearance of bruises. At a later stage the tissues begin to take on a brown tint, and later the surface cells become dark brown. The author has been unable to detect a bitter taste in the browned tissue of the fruit pits. The surface spotting is often accompanied by browning of the tissue immediately surrounding the vascular bundles. The surface spots may, however, occur without the internal browning, or the internal browning may be unaccompanied by any surface indications. Microscopical examination of a large number of fruit pits has given no indication of the presence of either bacteria or fungi, and it is believed that this form of disease is not very common in New England.

The second form of fruit spot of apples is said to be very common in the New Hampshire and Boston markets, often from 50 to 90 per cent of the fruit being spotted. It occurs on almost every variety of apple, but is worst on Baldwins, and the disease has been frequently referred to as Baldwin spot. The disease makes its appearance about the middle of August, and at this time one may notice spots of a deeper red color on the colored surface of the apple and darker green on the lighter portions. Usually they occur at a lenticel, but are sometimes covered with a smooth and apparently unbroken epidermis. The red color gradually changes to brown or black, and on the green surfaces the spots may become sunken, but the depressions are due to a lack of growth and not to any shriveling of the flesh.

The development of the spots seems to depend upon seasonal and storage conditions. When the weather is damp and foggy during the last weeks before harvesting, the spots on the red fruit surfaces develop rapidly and become black and sunken before the fruit is gathered. After gathering, the spots develop most rapidly on apples placed in boxes and barrels in cellar storage. Where the apples are placed immediately in cold storage there is little or no further development of the fruit spot. On withered fruit the green spots often stand above the surrounding portions, forming elevations that are in marked contrast with the yellow withered skin.

The author has sectioned many hundred fruit spots and found a parasitic fungus constantly associated with them. By means of inoculations he has demonstrated that this fungus, the various characteristics of which he describes, and for which he proposes the name *Cylindrosporium pomi* n. sp., is the cause of the trouble. The fungus gains entrance to the apple in July or early August, and when it finds its way into the intercellular spaces, obtains its nourishment from the plant cells. If the fruit is attacked before the cells have lost their power to respond to external stimuli, the fungus is soon partially surrounded by a layer of brown, thick-walled cells which may serve as a

barrier to further growth. If, however, the fungus attacks the host cells when they are nearly mature, it finds conditions more favorable to its development and the result is a more vigorous growth of the fungus and a rapid browning and drying of the host tissue.

Spraying with Bordeaux mixture has been demonstrated as a preventive of the disease, and applications made in June or early in July are as effective as those made earlier in the season.

A brief bibliography of the literature of this disease is given.

The apple-tree canker or black-rot fungus in South Africa, I. B. P. Evans (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 62–64, pl. 1*).—Attention is called to the occurrence of *Sphæropsis malorum* on apples from a number of districts in Cape Colony. It is apparent that the fungus is rather widely distributed and is causing considerable loss. The destruction of all decayed fruit, pruning out of cankers, and spraying with Bordeaux mixture are recommended as preventive measures.

Die back of peach shoots, G. Massee (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1908, No. 7, pp. 269–271, pl. 1; abs. in Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, p. 272*).—The author states that during the past few years numerous inquiries have been addressed to the Kew Gardens respecting the die back of peach shoots.

In the spring the leaf buds expand normally without any suggestion of the disease, but about the time when the blossom is fully expanded the young leaves wilt, turn brown, and die within a few days. At the same time the petals change to a rusty brown color and the flowers droop, but remain attached to the branches for some time, as do also the leaves. Finally the shoots assume a deep claret-red color and shrivel more or less as the season advances.

About midsummer, when the dead leaves and flowers have been removed by wind and rain, trees that have been badly diseased can be readily recognized by the appearance of naked shoots varying from 1 to 2 ft. in length. If these dead branches be examined during the months of May and June of the following year they will be found to be more or less thickly studded with minute, dull-orange-colored, tendril-like bodies, consisting of myriads of spores of a parasitic fungus. This parasite has so far failed to produce any other fruiting form than the conidia, and it has been identified as *Nænospora crocea*.

Investigations have shown that the shoots are capable of infection only when quite young, but that when the mycelium has gained entrance into the tissues it spreads rapidly and affects the entire growth of the season. Successful inoculation experiments have been made, but when branches more than 1 year old were inoculated no trace of disease was produced. The spores of the fungus do not appear to retain their germinating power for more than 3 months.

The citrus fruit rot, I. B. P. Evans (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 60–62, pl. 1*).—According to the author, considerable injury is being done to citrus fruits by the blue mold (*Penicillium digitatum*). A description is given of the fungus and its method of attacking the fruits, and, on the basis of information given in a bulletin of this Department (E. S. R., 20, p. 43), the author urges care in the management of orchards and in the handling of fruit in the course of preparation for market.

The diseases of the tea plant, C. Maublanc (*Agr. Prat. Pays Chauds, 8 (1908), Nos. 65, pp. 91–102, pl. 1; 66, pp. 227–241, pl. 1*).—A study is given of the various diseases to which the tea plant is subject, the information being largely drawn from notes of the late G. Delacroix.

Among the diseases of the foliage described the most destructive are the gray blight (*Pestalozzia guepini*), anthracnose (*Colletotrichum camelliæ*), blister

blight (*Exobasidium vexans*), brunissure (*Sorosphæra theæ*), and red rust (*Cephaleuros virescens*). In addition a number of other species of fungi that are found upon the leaves are described, but they are said to be seldom serious in their attack.

Among the most destructive diseases of the stem and roots of the trees are the thread blight (*Stilbum nanum*), canker (*Nectria ditissima*), a stem disease (*Massaria theicola*), horse-hair blight (*Marasmius sarmentosus*), root rots (*Rosellinia radiciperda* and *Trametes theæ*), nematodes, and phanerogamic parasites.

A root disease of Para rubber trees, W. J. Gallagher (*Agr. Bul. Straits and Fed. Malay States, 7 (1908), No. 11, pp. 515–522, dgm. 1*).—The author reports the rather common occurrence throughout the Malay Peninsula of a fungus which attacks the roots of the Para rubber trees (*Hevea brasiliensis*). The disease is seldom distributed over an entire estate, but is confined to limited areas which appear to serve as centers for its distribution.

The presence of the disease is not usually noticed until the tree is dead. The first symptoms are observed in the leaves becoming brown about the edges, and the entire leaf soon loses its natural color. Little or no latex will flow from wounds in the stem, and later the trees are blown down. This is apparently due to the destruction of the lateral roots of the trees. So far as the author has observed, the attack seems to be in the more superficial lateral roots, and on different occasions he has traced the mycelia of the fungus along the lateral roots to decaying jungle stumps.

Thus far, owing to a lack of fruiting bodies, the identification of the fungus has been impossible, but it is believed to be one of the higher fungi similar to the bracket fungi.

As remedial measures, the author suggests trenching about trees and destroying the fungus by exposure to the sun and the application of lime.

Recent investigations on the disease of fir trees caused by Phoma abietina, E. Mer (*Bul. Soc. Sci. Nancy, 3. ser., 9 (1908), No. 2, pp. 104–144*).—A discussion is given of the disease of firs due to *P. abietina*. The author protests against the name rust or reddening of firs, as he states that the reddish-brown color is due simply to the oxidation of the tannins in the leaves followed by their destruction by the fungus.

While there has doubtless been considerable loss in some regions due to the defoliation caused by this fungus, the author thinks it will seldom prove of a very serious nature. Where the fungus is abundant, it is recommended that the lower branches be cut from the trees and burned. This will not only improve the vigor of the trees, but through the removal of leaves weakened by lack of illumination, etc., the spread of the fungus will be checked.

The leaf rust of spruce, P. Delforge (*Bul. Soc. Cent. Forest. Belg., 15 (1908), No. 9; noted in Rev. Gén. Agron., n. ser., 3 (1908), No. 10, pp. 424–427*).—A description is given of a leaf rust of spruce due to the fungus *Chrysomyxa abietis*, which has proved rather destructive in a number of localities in Europe during the past season.

The microscopical character of the fungus and its effect on the plants are described, the injurious action being apparently due to the consumption by the fungus of the elaborated material in the leaves and the diminution of their assimilating surface. Later the fungus causes a premature falling of the leaves, the amount of injury varying with the intensity of the attack, and in different years, regions, etc.

As means for preventing the spread of the disease, the author recommends thinning out the trees, so that there will be a better circulation of air, thus re-

ducing the humidity. When possible the branches that are badly affected should be cut off and, if this is done late in the season, burned in order to prevent the germination of the teleutospores.

Yellow stripe in daffodils, H. R. Darlington (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 161–166*).—While daffodils are usually considered as exceptionally free from disease, the author calls attention to what is apparently a physiological disturbance which results in considerable injury to the plants.

This trouble, which is called yellow stripe, shows itself in a mild case as a scarcely perceptible discoloration or yellowing of the veins of the leaves, but in more serious cases distinct bands of yellow may be seen running lengthwise of the leaves. In bad cases no flowers at all will be produced, and the leaves wither before they are fully developed. Except in bad cases the yellow stripes seldom run the full length of the leaf.

The trouble is quite distinct from the yellowing of the leaf which takes place during the summer after the maturity of the bulb. The author believes that it is not a specific disease, but is a consequence of unsuitable conditions of soil, or inclement weather at the critical stage in the growth of the plant.

Parasitic rose canker, H. T. Güssow (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 222–230, figs. 4*).—A new disease of roses is described, which is said to be spreading in certain parts of Great Britain.

The disease apparently starts in the one-year-old wood, and is not noticed until far advanced. One of its principal characteristics is shown in the deep fissures covered with an abnormal growth, which have the appearance of canker spots. The bark bursts and the wound does not heal normally, but the callus continues to grow until badly cankered spots result. The author believes that the disease is identical with that described by Soraner (E. S. R., 18, p. 1143), in which case the disease was attributed to frost injury.

A study of material showed there was present a fungus that is believed to be identical with that described by Köck (E. S. R., 17, p. 674), but the author thinks that the species does not differ from the common *Coniothyrium fuckelii*, and he considers the latter fungus to be the cause of the rose canker described.

Notes are also given on a blackberry canker due to *C. tumæfaciens* n. sp. This fungus causes the development of excrescences on the stems from the size of a pea to that of a walnut, or even larger. A technical description of the fungus is given.

A new lilac leaf disease in England, H. T. Güssow (*Gard. Chron., 3. ser., 44 (1908), No. 1146, pp. 404, 405, figs. 2*).—A description is given of a leaf disease of lilac due to *Pseudomonas syringæ*. The affected leaves are greatly disfigured and the injury appears suddenly and seems to spread rapidly. In an early study of the disease a fungus was quite commonly observed, and the injury was believed to be due to *Cladosporium herbarum*. Subsequent studies, however, showed that the fungus is of secondary importance and that the primary trouble is due to bacteria. The organisms have been isolated, cultivated in various media, and successful inoculation experiments conducted, resulting in the production of typical forms of the disease. The organism is apparently that described by van Hall (E. S. R., 13, p. 1019), and it has also been shown to be capable of infecting a number of other plants, among them the apple, sour cherry, buckwheat, *Atriplex hortensis*, black poplar, etc.

On account of the nature of the disease, the author states that spraying would be futile against its spread, but that a careful lookout should be kept for spots upon the foliage and all diseased shoots cut out and burned.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The decision of the Supreme Court of the United States on the sale of imported game. T. S. Palmer (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 67, pp. 12*).—The author here reviews the so-called Silz case which is based upon the sale in New York during the closed season of English plover and Russian grouse and the possession of one golden plover from England and one blackcock from Russia. The decision rendered on November 2, 1908, by the Supreme Court of the United States, which is here published in full, sustains the right of the State to regulate the possession and sale of game taken outside its boundaries. This decision directly affects dealers in game, importers, and many persons engaged in the millinery trade.

A history is given of the question of the right of a State to regulate possession and sale of game taken outside its boundaries, with references to decisions on possession and sale of imported game and fish.

First report on the economic features of turtles of Pennsylvania, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 6 (1908), No. 4–5, pp. 107–195, pls. 9, figs. 16*).—A report of studies made of the turtles of the State with special reference to their food habits. Eighteen species are described as probably found in the State.

The snapping turtle (*Chelydra serpentina*) is reported to be more destructive than beneficial in its feeding habits, particularly as it is liable to be a very serious enemy of young ducks in ponds. The musk turtle (*Aromochelys odoratus*) apparently feeds almost wholly upon mollusks and insects, and is considered as being decidedly beneficial. The painted turtle (*Chrysemys picta*) appears to be almost equally herbivorous and carnivorous. Out of 86 examined 61 had eaten insects, 10 containing specimens of the rose bug. The author concludes that this species must be regarded as beneficial.

The speckled tortoise (*Clemmys guttatus*) was found to be particularly insectivorous and beneficial rather than obnoxious. Forty specimens of the common box turtle (*Terrapene carolina*) were examined, 62 per cent containing vegetable matter and 80 per cent animal tissue, including snails, slugs, millipedes, and insects.

A food table of the turtles examined and a bibliographical list are given.

The influence of minimum temperatures in limiting the northern distribution of insects, E. D. Sanderson (*New Hampshire Sta. Sci. Contrib. 1, pp. 245–262, maps 7; Jour. Econ. Ent., 1 (1908), No. 4, pp. 245–262, maps 7*).—This is a paper read before the section of economic zoology of the Seventh International Zoological Congress, held at Boston in 1907.

Examinations of the nests of the brown-tail moth collected in Maine and New Hampshire have shown that in those of average size 72 to 100 per cent of the larvæ have been killed by a temperature of —24° F. or lower. In large nests on oak, however, only 57 per cent were killed. Studies have been made of the minimum isotherms. When these are compared with the boundaries of the life zones as charted by the Biological Survey of this Department, many similarities become apparent, but also a number of important differences. "Upon comparing the distribution of several well-known injurious insects with the average annual minimum isotherms, they were found to define the northern limits in some instances rather better than the life zones."

Evidence is brought forward to show that the sum of positive temperatures [effective temperatures] for the season of growth and reproduction is not the only or the most important factor governing distribution northward, but that

the minimum temperature is perhaps the more important factor. Among the insects whose distribution is considered as more or less controlled by minimum temperatures are brown-tail moth, harlequin cabbage bug, cotton-boll worm or corn earworm, West Indian peach, San José and other scales, asparagus beetle, elm-leaf beetle, Morellos orange fruit worm (*Anastrepha ludens*), rose chafer, and the striped cucumber beetle. It is concluded that the present upper austral zone of the survey does not extend far enough to the northeast and extends too far to the northwest. Maps are given showing the isotherms for minimum temperatures in the United States and Europe and of the life zones and the distribution of San José scale in this country.

Observations on the social parasites and slavery of ants, E. WASMANN (*Biol. Centbl., 28 (1908), Nos. 8, pp. 257–271, fig. 1; 9, pp. 289–306, fig. 1; 10, pp. 321–333, fig. 1; 11–12, pp. 353–382; 13, pp. 417–441; abs. in Nature [London], 79 (1908), No. 2037, pp. 51, 52*).—A series of papers giving the results of recent elaborate observations and experiments respecting the behavior of different species of ants, living together in the same nest, toward each other and their treatment of small beetles and other parasites which live in ants' nests.

A preliminary list of the lepidoptera of western Pennsylvania collected in the vicinity of Pittsburg, II. ENGEL (*Ann. Carnegie Mus., 5 (1908), No. 1, pp. 27–136*).—A list prepared by the author in which the nomenclature and order given in Dyar's list is followed. Nearly 1,500 species and varieties are enumerated and it is stated that more than 100 additional species from this section still remain in collections awaiting determination.

A monographic catalogue of the Mymarid genus Alaptus of Haliday, with descriptions of three new North American forms and of A. iceryæ from type material, A. A. GIRAULT (*Ann. Ent. Soc. Amer., 1 (1908), No. 3, pp. 179–195, figs. 5*).—Of the 11 species here listed, the host relations of 4 are known, 3 having been reared from coccidæ and 1 from psocid eggs.

Locust plague in Panama, G. T. WEITZEL. (*Daily Consular and Trade Rpts. [U. S.], 1908, No. 335¼, p. 5*).—The plague of locusts against which the government of Panama has been fighting for several months has become a serious menace to the agricultural interests of the country, particularly in the district of Chepo, where great areas have been denuded of foliage and plants and crops almost totally destroyed. A commission appointed appropriated the sum of $475 per month to fight the pest.

"The method of extermination most generally adopted has been to dig a trench about 50 ft. in length, 2 ft. wide, and 1 ft. deep, with perpendicular sides, in which the locusts are driven by men beating the grass and trees with switches. In this way millions are collected and are destroyed with a solution of strong lye soapsuds. The trench is then refilled with earth so as to allay the odor."

Notes on grasshopper (or locust) swarms in New South Wales during 1907–8, W. B. GURNEY (*Agr. Gaz. N. S. Wales, 19 (1908), No. 5, pp 411–419, pl. 1, figs. 6*).—Besides *Chortoicetes terminifera* which is described as the most widespread and destructive, *C. pusilla*, *Oedalus senegalensis*, *Locusta danica*, and *Cyrtacanthacris exacta* are mentioned. *Sarcophaga pachytyli* and *S. aurifrons* are parasitic upon these pests.

In experiments with kerosene emulsion about 50 per cent were destroyed. Poisoned bait consisting of Paris green and bran mixed in the proportion of 1:10 and made into a mash with water sweetened with molasses destroyed many. An emulsion of a carbolic sheep wash was successfully used. Many of the larger hoppers were found eventually to recover from the effects of contact sprays.

Locust destruction work in the Transvaal. D. GUNN (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 75–80, maps 3*).—A report upon the work against the brown

and red locust during 1907–8 in the various districts of the Transvaal, accompanied by maps showing the areas infested.

Treatment of cotton pests in the West Indies in 1907, H. A. Ballou (*West Indian Bul., 9 (1908), No. 3, pp. 235–242, figs. 10*).—The attacks by *Alabama argillacea* were very severe during the year, except in St. Vincent, where it appeared for the first time. On this island the Jack Spaniard (*Polistes annularis*) proved a satisfactory check, while *Calosoma calidum* was also of considerable benefit. The smaller cotton worm (*Aletia luridula*) was the prevailing pest in certain fields in Barbados and was also found in Antigua. *Heliothis obsoleta* occurred in greater numbers than in previous years and threatened to become a serious pest on a few estates in Barbados and Antigua. The corn earworm (*Laphygma frugiperda*) attacked cotton bolls to some extent on a few estates.

Aphids were abundant in certain localities in Barbados. Ladybirds and the lace-wing fly, though abundant in most parts of the island, were lacking in others or not sufficiently abundant to prevent damage by this pest. Cutworms (*Prodenia* spp.) were less injurious than in previous years. Poison bait made of bran, Paris green, and molasses gave good results. Cotton stainers (*Dysdercus* spp.) were not a serious pest generally during the season, although very abundant and injurious on a few estates. The practice of collecting and killing them was a sufficient check.

The leaf blister-mite (*Eriophyes gossypii*) though present in nearly every cotton field in the island did not cause as much injury as formerly. Sulphur and lime gave good results. The red maggot (*Porrichondyla gossypii*) was not reported as doing great damage. The only remedy practiced is that of cutting out attacked stems and branches. The cotton black scale (*Saissetia nigra*) was a serious pest, but the native parasite, *Zalophothrix mirum*, has been increasing in abundance during the past 2 years and it is hoped that it may prove an efficient check.

The boll-weevil problem, with special reference to means of reducing damage, W. D. Hunter (*U. S. Dept. Agr., Farmers' Bul. 344, pp. 45, figs. 9*).—This is a summary account of the practical results obtained from investigations of the cotton boll weevil by the Bureau of Entomology of this Department and is intended to supersede Farmers' Bulletin 216, previously noted (E. S. R., 16, p. 991). Special attention is given to the life history and habits of the pest. The methods of control, which are described in detail, are summarized as follows:

"Destroy the vast majority of weevils in the fall by uprooting and burning the plants. This is the all-important step. It results in the death of millions of weevils. It insures a crop for the following season.

"Destroy also many weevils that have survived the preceding operation and are found in the cotton fields and along the hedgerows, fences, and buildings. This is done by clearing the places referred to thoroughly.

"As far as possible, locate the fields in situations where damage will be avoided. This can not be done in all cases but can frequently be done to good advantage.

"Prepare the land early and thoroughly in order to obtain an early crop. This means fall plowing and winter working of the land.

"Provide wide rows, and plenty of space between the rows and the plants in the drill, for the assistance of the natural enemies of the weevil, which do more against the pest than the farmer can do himself by any known means. Check-rowing, wherever practicable, is an excellent practice.

"Insure an early crop by early planting of early-maturing varieties, and by fertilizing where necessary.

"Continue the procuring of an early crop by early chopping to a stand and early and frequent cultivation. Do not lose the fruit the plants have set by cultivation too deep or too close to the rows.

"Where the labor is sufficient, pick the first-appearing weevils and the first-infested squares. Do not destroy the square but place them in screened cages. By this means the escape of the weevils will be prevented, while the parasites will be able to escape to continue their assistance on the side of the farmer.

"Use a crossbar of iron or wood, or some similar device, to cause the infested squares to fall early to the ground, so that they will be exposed to the important effects of heat and parasites.

"Do not poison for the leaf-worm unless its work begins at an abnormally early date in the summer."

The red cotton bug (Dysdercus cingulatus), H. M. LEFROY (*Mem. Dept. Agr. India, Ent. Ser., 2 (1908), No. 3, pp. 47–58, pl. 1*).—This pest is described as the source of considerable injury to cotton in reducing the vitality through sucking the juices of young shoots and bolls, producing small bolls containing bad fiber. Its natural enemies include a tachinid fly that is parasitic upon the adult bug, a reduviid (*Harpactor costalis*) and several birds, particularly the black-headed oriole (*Oriolus melanocephalus*).

The cotton leaf roller (Sylepta derogata), H. M. LEFROY (*Mem. Dept. Agr. India, Ent. Ser., 2 (1908), No. 6, pp. 95–110, pl. 1*).—The life history and habits of this moth are here described. It is a source of injury through stripping the leaves of the cotton plant. An undescribed hymenopterous parasite is stated to be an important factor in checking the increase of the pest. The destruction of the rolled leaves with the caterpillars from the beginning of the season is said to be effective. Spraying with lead arsenate is reported to control the pest.

The tobacco caterpillar (Prodenia littoralis), H. M. LEFROY (*Mem. Dept. Agr. India, Ent. Ser., 2 (1908), No. 5, pp. 79–93, pl. 1, fig. 1*).—A detailed account is given of the biology of this insect. In addition to the tobacco plant of which it is a serious pest, it is described as injuring a number of other crops including rice, corn, and grass, but attention is called to the fact that while in Egypt it has been described as attacking cotton it has not been found to do so to any extent in India.

Hand collection of the leaves within 3 days after hatching and the application of lead arsenate where spraying is possible are recommended. Where the caterpillar is so abundant that it moves in swarms, digging trenches to isolate it is recommended, the trenches preferably to be filled with water and kerosene poured thereon.

Attention is also called to the fact that the American boll worm (*Chloridea obsoleta*), while abundant on other food plants has in India only twice been observed feeding upon cotton.

Melon aphis, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 33 (1908), No. 4, pp. 491–496, figs. 2*).—*Aphis gossypii* by reason of its great destructiveness attracted attention in many districts during 1907. In the Cape Peninsula whole fields of watermelons and cucumbers were killed by it, and these and other cucurbitous plants including the calabash were seriously injured by it through the southwestern parts of the colony. The principal South African ladybird feeding on this pest is said to be *Chilomenes lunata*. Syrphus fly enemies of this insect are also said to be common and several species of internal parasites have been bred. Preventive and remedial measures are considered.

A few orchard plant lice, C. P. GILLETTE and E. P. TAYLOR (*Colorado Sta. Bul. 133, pp. 3–47, pls. 2, figs. 3*).—The authors report studies of the life his-

tories, habits, and nature of the injury to Colorado orchards caused by several species of plant lice with preventive and remedial measures.

The woolly apple aphis (*Schizoneura lanigera*) is considered as serious a pest in Colorado as the codling moth. The greatest injury to the tree is due to the root attack, but direct losses are greatest from injury to the branches and fruit. But little injury appears to be done to roots that are more than 10 in. below the surface of the soil, which fact should be taken advantage of in setting trees. Succulent and rapid growing parts, especially grafts, are said to be very susceptible. In Colorado the Missouri pippin seems to be worst infested while Northern Spy is practically exempt. Care should be taken that only clean stock be set out. Experiments were conducted with insecticides from which the following directions have been formulated as to the best methods of treatment:

"Just before the buds open in the spring, spray very thoroughly with a 7 per cent kerosene emulsion, black-leaf dip 1 lb. to 60 gal. of water (or some other strong tobacco decoction) or a good whale-oil soap, 1 lb. to 6 gal. of water. Spray the entire trunk and also the ground about the crown of the tree. Immediately after treatment apply a tanglefoot band over cotton so as to prevent the upward migration. If the lice become very numerous at any time upon the tops, spray them forcefully with the 7 per cent emulsion, or black leaf, 1 part in 70 parts of water. Root treatments are temporary in their effects. When the roots become very badly infested, treat as above described with 10 per cent kerosene emulsion, black leaf dip (1:50), 2 to 3 gal. to a tree, or, if the soil is quite open and porous, carbon bisulphid."

The green apple aphis (*Aphis pomi*), which is one of the worst orchard pests in Colorado, is the species most commonly brought into the State in the egg stage upon nursery stock. The Missouri pippin is said to be particularly attacked by this species while the Northern Spy is rarely so. Experiments have shown that oil emulsions destroy the eggs only at very high strengths. Lime-sulphur mixtures have proven quite successful, however. Kerosene emulsions one-fifteenth oil and black-leaf dip 1 part in 70 parts of water, are said to be the two sprays most favored at the present time.

The clover aphis (*Aphis bakeri*) ranks next to *A. pomi* in numbers as a leaf-infesting species of the apple. While it appears to have a tendency to accumulate in the apple blossoms, it is not as yet considered a serious pest in Colorado orchards.

The European grain aphis (*Aphis (Siphocoryne) avenæ*) has been found upon apple, pear, and quince trees in the State but not in sufficient numbers to do appreciable harm.

The rosy apple aphis (*Aphis pyri*) has appeared in orchards of the Grand Valley attacking the leaves and causing them to curl similarly to these affected by *A. pomi*.

The sweet-clover aphis (*Aphis medicaginis*) while preferring certain legumes, as sweet clovers, locos, black locust, and wild licorice, has been frequently found early in the season upon tender new shoots of the apple and other fruit trees. It is not likely, however, that the species will ever become a serious orchard pest.

Two peach plant lice, the green peach aphis (*Myzus persicæ*) and the black peach aphis (*Aphis persicæ-niger*) are considered. *M. persicæ* is said to be by far the most abundant peach louse in the State. This species is said to have been reported in this country upon the peach, plum, cherry, and many succulent plants under different names. *A. persicæ-niger* was first observed in Colorado in 1905. While at present known to occur only in a few localities on the west-

ern slope of the State it is expected that it will, in a few years, become distributed throughout nearly all the important peach sections.

Three important plum lice considered are the mealy plum louse (*Hyalopterus arundinis*) which is sometimes sufficiently numerous to completely cover the under surface of the leaves, the rusty brown plum louse (*Aphis setariæ*) which is found particularly upon red or American plums, and the hop plant louse (*Phorodon humuli*) which inhabits the plum as a winter host plant.

The black cherry louse (*Myzus cerasi*) is said to be generally distributed through the orchards of the eastern slope of the Rocky Mountains in Colorado.

Directions for the preparation of the insecticides recommended in the bulletin are appended.

Orchard plant lice and their remedies, C. P. Gillette and E. P. Taylor (*Colorado Sta. Bul. 134, pp. 3–16*).—An abbreviated edition of the above.

Control of leaf blister mite in apple orchards, P. J. Parrott (*New York State Sta. Bul. 306, pp. 417–438*).—This is a continuation of work previously noted (E. S. R., 18, p. 955).

The general spotting of apple foliage by this pest is said to have been an annual occurrence for several years, the pest having now become quite common throughout the apple-growing sections of western New York. It is also known to occur in Massachusetts, Pennsylvania, Illinois, and the province of Ontario.

It is concluded that the experiments reported show very conclusively that the blister mite is not a difficult pest to combat and that it can be efficiently controlled by sulphur sprays, miscible oils, and homemade oil emulsions. Orchards regularly sprayed with such mixtures are not subject to injury by the mite.

"Comparative tests of the boiled lime-sulphur wash, the homemade concentrated lime-sulphur wash, and two commercial preparations gave equally satisfactory results. One application of either of these sprays has practically prevented spotting of foliage by the mite.

"With the increased availability of the sulphur sprays these are now practicable remedies for the treatment of apple orchards for the blister mite. In employing these remedies for this purpose, a plan of spraying well adapted for the treatment of apple trees is an application of a sulphur wash as the buds are swelling and before the leaves appear, followed by the usual second and third applications of the Bordeaux mixture in their proper season."

Sulphur sprays for blister mite, F. H. Hall (*New York State Sta. Bul. 306, popular ed., pp. 3–7*).—This is a popular edition of the above bulletin.

A note on the fumigation of citrus trees with hydrocyanic-acid gas, F. Thomsen (*Transvaal Agr. Jour., 7 (1908), No. 25, p. 74, pl. 1*).—A description with illustrations of frame tents used in fumigating citrus trees. A table is given showing the quantities of materials to be used in the various sizes of of tents.

The castor semi-looper (Ophiusa melicerte), H. M. Lefroy (*Mem. Dept. Agr. India, Ent. Ser., 2 (1908), No. 4, pp. 59–77, pls. 2, fig. 1*).—A general account of the life history and habits of this insect, which is the source of considerable injury to the castor bean (*Ricinus communis*). In addition to several other plants, tea is occasionally attacked. A hymenopteron and a tachinid fly are reported as important enemies. Cultural methods, hand picking, and the application of arsenicals are described as remedial measures.

Pemphigus tessellata: Alternate host, migrants, and true sexes, Edith M. Patch (*Ent. News, 19 (1908), No. 10, pp. 484–488, pl. 1*).—From observations recorded by the author it appears that the maple is an alternate host plant of the alder blight (*Pemphigus tessellata*) and that the maple forms described by Riley as *P. acerifolii* are *P. tessellata* migrants.

Chrysomelid enemies of the osier and experiments with liquid insecticides, J. Feytaud (*Rev. Vit., 30 (1908), Nos. 771, pp. 344–348; 772, pp. 374–378; 773, pp. 404–409*).—The 2 species of willow largely grown in the department of Gironde (*Salix fragilis* and *S. viminalis*) are attacked by a number of leaf-eating beetles. These pests are said to reduce enormously at times the quantity and quality of this important crop. Species belonging to the genera Lina, Phratora, Phœdon, Plagiodera, etc., are the most injurious, particularly the species *Lina populi, L. tremulæ*, and *Phratora vulgatissima*. Many of the adult beetles, particularly of *L. populi*, are easily destroyed by burning litter, etc., in the vicinity of the osieries, into which they crawl to hibernate. Hand picking is said to be practiced to some extent, but experiments conducted appear to show that tobacco decoction mixed with soap is the most effective means of control. *L. populi* is said to be attacked by a tachinid fly (*Exorista dubia*), which deposits its eggs upon the larvæ. A tachinid is also reported to attack *P. vulgatissima*, a parasitism of 30 per cent having been recorded.

A brief account of the anatomy and classification of the Ixodoidea with special reference to the French fauna, A. Bonnet (*Arch. Par., 12 (1908), No. 2, pp. 224–267, figs. 44*).—The anatomy, biology, and classification of ticks are briefly considered. A table is given for the separation of the genera and species occurring in France, together with brief descriptions of each, and a bibliographical list.

A list of the ticks of South Africa, with descriptions and keys to all the forms known, C. W. Howard (*Ann. Transvaal Mus., 1 (1908), No. 2, pp. 73–169, pls. 16*).—An account of the ticks occurring in South Africa, their hosts and distribution, with descriptions and tables for their classification. A bibliographical list is given.

A new genus of the Siphonaptera, C. Fox (*Ent. News, 19 (1908), No. 10, pp. 452–455, fig. 1*).—A species of flea taken from *Scapanus californicus* in San Francisco is described as belonging to a new genus and species and named *Corypsylla ornatus*.

Some Irish experiments on warble flies, G. H. Carpenter (*Irish Nat., 17 (1908), No. 11, p. 245*).—Life history studies and investigations of the efficacy of commonly accepted means for checking the attacks of warble flies have been carried on during the past 4 years. Experiments have shown that the application of dressings such as carbolic dip, oil and tar smear, and paraffin emulsion are of but little value in preventing egg deposition on the animal.

In the spring of 1907 on one farm the maggots were systematically squeezed out and destroyed, 2,000 thus being obtained from 194 head of cattle or an average of over 10 per head. The effect was strikingly shown in the spring of 1908 when an examination made on this farm of 166 head of cattle resulted in the finding of but 694 maggots or an average of 4.2 per head. Two calves muzzled by day and tied between stakes at night during the summer of 1907 were the only ones on the farm entirely free from warbles in the spring of 1908.

Hypoderma bovis seems to be more common in Ireland than *H. lineata*. In both species the interval between the emergence of the maggot from the beast's skin and the appearance of the fly is about 7 weeks.

The extermination of mosquitoes, E. C. Levy (*Richmond, Va., Health Dept., 1908, pp. 14, figs. 3*).—The health department of the city of Richmond is carrying on an active campaign against mosquitoes. This article describes their breeding habits and methods of extermination through draining, filling in, or kerosening the breeding places.

Miscellaneous papers on apiculture. The relation of the etiology (cause) of bee diseases to the treatment, G. F. White (*U. S. Dept. Agr., Bur. Ent. Bul.*

75, *pl. 4, pp. 33–42*).—In this paper, which was presented at the meeting of the National Bee Keepers' Association, held at Detroit, October 14, 1908, the author discusses the relation of the etiology of bee diseases to their treatment. The predisposing causes of disease considered include age, sex, heredity, race, climate, and preexisting disease, while the exciting causes are found in food and micro-organisms. American foul brood, European foul brood, so-called "pickled brood," and paralysis are described and the importance of bee keepers becoming acquainted with their etiology is pointed out.

South African bee keeping. H. L. ATTRIDGE (*Agr. Jour. Cape Good Hope, 32 (1908), No. 6, pp. 692–704, figs. 9; 33 (1908), Nos. 1, pp. 46–56, figs. 11; 2, pp. 156–170, figs. 12; 3, pp. 307–317, figs. 6; 4, pp. 438–460, figs. 14*).—An extended account of bee keeping in South Africa, illustrated by many original photographs.

FOODS—HUMAN NUTRITION.

Digestibility of starch of different sorts as affected by cooking, EDNA D. DAY (*U. S. Dept. Agr., Office Expt. Stas. Bul. 202, pp. 42, figs. 6*).—Artificial digestion experiments, using malt diastase, taka diastase, and saliva, were made with raw starch, starch cooked below the boiling temperature, and starch cooked for different lengths of time and in different ways: Potato, arrowroot, tapioca, sago, wheat, corn, rice, and barley starches were used in the experiment. The report of experiments is preceded by a review of previous investigations on the subject, particular attention being given to the amyloses and related substances found in raw starch grains.

As the author points out, the starches used in the experiments had been separated from the other substances with which they are ordinarily combined in foods, and this and the further fact that artificial methods of digestion were used should be borne in mind in considering the results.

"Raw starch, as shown by the experiments reported, digests very much more slowly than the starch in the forms of a paste.

"Starch paste made below the boiling temperature of water is as easy to digest as that which has been boiled a few minutes, though it is not as homogeneous.

"Potato, arrowroot, and probably tapioca and sago starch pastes are not made more easily digestible by long-continued cooking. On the other hand, the cereal starches are made more easily digestible by long cooking, though the change occurs very slowly and perhaps the increased digestibility is not sufficiently great to justify the trouble, under ordinary circumstances at least, for separated starch such as is used in cookery. However, in the case of starch still inclosed in cellulose cells, as in many starchy foods, the long-continued cooking may be necessary. The commercial preparations of cornstarch require 30 to 40 minutes' cooking because of the improvement in flavor which results.

"Skin formation as well as lumps should be avoided in cooking starch—the latter contain raw starch, the former reverted amylodextrin, and both are very slow of digestion.

"The selection of potato starch instead of corn or wheat starch for thickening sauces, in accordance with the custom of French cooks, is rational, since it contains no rose amylose and so forms a clearer and more digestible sauce, and since it does not require 40 minutes' boiling for improvement in flavor, as is the case with cornstarch.

"Increasing the proportion of diastase to starch in artificial digestion experiments markedly hastens the digestion of both blue and red amylose. It would appear, therefore, that eating starchy foods slowly, which would of course increase the proportion of saliva and ptyalin to a given quantity of starch, would

be of more value from the standpoint of digestion than would any cooking of starch beyond the stage of paste formation."

Yeast, F. L. Ward (*Bakers' Helper, 22 (1908), No. 260, p. 1134*).—A summary of data on the conditions which are considered essential for satisfactory yeast development, together with information regarding a course in yeast at the University of California which, though designed primarily for vineyardists and wine makers, is in the author's opinion also applicable to the baking industry.

Changes in stored flour, H. G. Bell (*Oper. Miller, 13 (1908), No. 12, pp. 591, 592, figs. 4; Bakers' Helper, 22 (1908), No. 260, pp. 1132–1134, figs. 4*).—The acidity and baking qualities were studied of flours stored at high and low temperature with high and low humidity in each case.

"The warm, dry storeroom seems to be the most desirable for maintaining the quality of the flours. The next best condition of storage seems to be where the storeroom is cool and comparatively dry. The worst condition is where the storeroom is cool and very damp. In such a place, bacteria and fungi or molds grow most readily and work destruction on the flour stored there. Then, to bakers and flour merchants we would say—do not store your supply of flour in damp underground or partly underground storerooms. If stored there it will get sour and poor in quality in a very short time. Store supplies of flour in a warm, dry place or, if it can be kept dry, in a cool, dry place."

The character of old flours, L. Vuaflart (*Ann. Chim. Analyt., 13 (1908), No. 11, pp. 437, 438*).—Data are reported and discussed regarding the examination of 4 samples of new flour which in the character of their gluten and acid content resembled old flours.

Milling and baking test. Tests of flour sold in North Dakota, E. F. Ladd (*North Dakota Sta. Bul. 82, pp. 717–793*).—The investigations here reported were undertaken to determine the relative milling and bread making qualities of Fife and Bluestem wheats as compared with durum wheats and for the purpose of bringing together data regarding the range and composition of wheats and flours from local grown products. Examination was also made of commercial flours on sale in North Dakota with a view to determining their composition and bread making quality, and also to secure data regarding the extent to which bleaching of flour is practiced.

In the comparison of local grown wheats milling tests were made with 15 samples of Fife and Bluestem wheats and an equal number of samples of durum wheats.

In general, "the durum gave a rather larger percentage of flour than did the Fife and Bluestem, and the average weight per bushel for clean wheat was greater, yet the amount of high-grade flours were in favor of the Fife and Bluestem. . . .

"It takes slightly less durum to produce a barrel of flour than of Fife and Bluestem. The percentage of bran is less in the durum than in Fife and Bluestem, but the proportion of shorts is higher. The kernel of grain in the case of durum averages nearer than for the Fife and Bluestem."

As shown by the gluten tests, "the differences in expansive properties are particularly marked between the several grades of flour. The introduction of the first clear into the patent, or the lengthening out of the patent, as is often done, must necessarily result in decreasing the expansive properties. When the patent and first clear are united and sold as straight, or, as is more often done, bleached and sold as patent, or, at least, in place of patent, we can not wonder at the lowering of strength now generally recognized in many brands of flours.

"The expansive properties of the durum gluten are not equal to that from the Fife, as indicated in these tests, and this is further borne out in the baking

tests with the two flours. The physical properties of the gluten from a patent or first clear also differ in many other respects not clearly indicated by the above tests, but soon recognized by one who is engaged in washing out glutens."

The analyses of the flour samples showed in general that "the durum wheats have shown higher percentages of total protein than found in Fife and Bluestem wheats. The analyses of the flours do not average as high for the same grade of durum as for other wheats. On the other hand, analyses of previous years have shown the reverse order, but more markedly is this noticeable by comparing the analyses above given with the average for the section beyond on commercial flours as taken up in the markets of this State."

From the baking tests which were made with the flours ground at the station and the commercial samples it appeared, that "the volume of loaf for the commercial flours averages higher than for the experimental lots tested, but on the other hand the amount of flour used per loaf is greater for the commercial product and the number of loaves of bread per barrel is proportionately less than for the experimental flours. In making comparison it is essential that all this data be taken into consideration. . . .

"The commercial flours required a greater amount of flour to produce a dough of a given consistency and they made a less number of loaves of bread per barrel than any flour produced at the mill, including the first patent and the first clears. On the other hand the volume of the loaf, for the commercial flours, averaged quite a considerable above that of the test flours produced at the college. It should be said also that when several of the mill flours were blended better results were secured in bread production than where the individual samples were tested alone."

As regards the gluten tests made with the commercial flours, the results "show less of wet and of baked gluten for the commercial flour than either of the others and in expansion the gluten for the commercial flours is less than that produced from Dakota Fife and Bluestem wheats as a patent, but superior to that produced from the durum."

Analyses of the commercial flours are reported as well as determinations of the acidity and the nitrogen present as nitrites. The data indicate on an average 2.65 mg. nitrites per kilogram of flour. According to the author, the investigations are to be continued.

Chemically treated flours, E. F. Ladd (*North Dakota Sta. Spec. Bul. 9, pp. 1–14; Jour. Biol. Chem., 6 (1909), No. 1, pp. 75–86*).—From artificial digestion experiments and studies of the effect of bleaching on flour constituents and from earlier work on related topics, conclusions were drawn from which the following statements are quoted:

"Nitrous and nitric acid are two of the constituents formed from the bleaching of flour with nitrogen peroxid. The nitrites and nitrates, or nitrite and nitrate reacting material, are among the products formed in the flour. Bread as baked in the home by the domestic method will contain from one-third to one-half of the nitrite reacting material found in the flour.

"Oil properly extracted and purified from unbleached patent flour contains no nitrogen. Oil extracted from bleached flour and purified by the same methods gives a strong reaction for nitrogen, thus confirming the statement made by Lewkowitsch. . . . Artificial digestion experiments with pepsin solutions show that the gluten from the unbleached flour was digested in 4 hours and 57 minutes, while under the same conditions the gluten from the bleached flour was digested in 8 hours and 40 minutes.

"The baked gluten from the bleached and unbleached flours showed similar variations but not so wide, the time of digestion being much less; the same is true for the bread made from such flours. In pancreatic digestion the glutens

digested in 3.19 hours from bleached flour, and in 2.31 hours from unbleached flour. The time of digestion in pancreatic solutions of the baked gluten and of the bread was in favor of the unbleached product. The experiments made with the keeping quality of bread made from bleached and unbleached flour demonstrated the antiseptic effect of the bleaching agent.

"It has been demonstrated that when the diazo or like action took place, the acid acted upon the gluten of the flour changing its composition so that nitrogen gas was given off when the flour was treated with an acid."

Effect of bleached flour extracts on rabbits, E. F. Ladd and H. L. White (*North Dakota Sta. Spec. Bul. 9, pp. 15–26*).—The authors have tested the effects on rabbits of alcoholic and aqueous extracts of bleached and unbleached flour.

Quotations from their conclusions follow:

"There are produced in flour, as the results of artificial bleaching, toxic bodies. . . . Alcoholic extracts prepared from unbleached flour and fed to rabbits did not affect them. Alcoholic extracts prepared in the same manner from commercially bleached flour and fed to the rabbits in the same way caused their death within a few hours. Alcoholic extracts prepared from overbleached flour in the same manner and fed in the same way to rabbits caused their immediate collapse and death.

"Aqueous extracts prepared from overbleached flours when fed to rabbits caused their immediate collapse and death. Alcohol and aqueous extracts from overbleached flour, when neutralized with sodium bicarbonate, and fed to rabbits, caused the death of the rabbits in a short time, demonstrating that it was not the acidity that produced the death of the rabbits.

"In preparing aqueous extracts all nitrite reacting material disappeared; hence, the death of the rabbits, in this case, must have been due to the presence of other toxic material than that of nitrites."

Experiments on the spoilage of tomato ketchup, A. W. Bitting (*U. S. Dept. Agr., Bur. Chem. Bul. 119, pp. 37, pls. 2, figs. 5*).—Experiments on the manufacture of tomato ketchup without chemical preservatives under factory conditions and upon a commercial scale are reported. In addition, experiments with sodium benzoate and the household preservatives salt, sugar, spices, vinegar and acetic acid, and oil were also made, as well as studies of Penicillium in ketchup. It is stated that the product obtained when ketchup was made without preservatives was of excellent consistency, flavor, and color, and the results in the author's opinion prove "that such a ketchup can be made and delivered to the consumer in perfect condition; the product in question having already stood 10 months, unopened, without showing the slightest indications of spoilage. . . .

"The formula employed regularly in the factory where the experiment was conducted was used, but other recipes could be adapted without changing the character of special brands." The precautions observed in the manufacture of such a product are given in some detail. These were, in brief, the use of clean, whole, ripe fruit and high-grade salt, sugar, vinegar, and spices, thorough cooking, use of sterilized bottles, and care and cleanliness at every step.

While some of the condiments used had a limited antiseptic value, they are only of incidental value for this purpose.

"The spoilage of ketchup after opening depends more upon the temperature of the place in which it is kept than on any variation in the manner of processing. Fresh ketchup held, after opening, at a temperature of 95° F. kept for 5 days on an average without any trace of mold appearing; at 72° it kept for 6 days; at 67° for 8 days; about 46° (refrigerator), 14 days; and at from 30° to 60° for 27 days. These figures represent the time at which the first

trace of spoilage occurred in the neck of the bottle—had this been removed the figures would be much increased—and by no means represent the maximum time during which the ketchup could have been used, the maximum figures, even under these conditions of observation, varying from 8 to 58 days. The keeping of the ketchup in warm storage at 70° for 150 days before opening hastened the average time of spoilage after opening about one day. The advisability of using small containers, to get the best results with a first-class ketchup, is apparent.

"Sodium benzoate, even when used in the proportion of 0.1 per cent, is not always effective, and has an injurious effect upon the living matter of the molds, shown by the distortion and swelling of the filaments, which are filled with a coarse granular protoplasm containing much fat."

The use of the microscope to detect artificially colored ketchup and ketchup made from trimming stock, or from tomatoes that have been allowed to spoil is explained, and it is maintained that ketchup as ordinarily made from trimming stock should be so designated as to differentiate it from that made from sound fresh tomatoes, as the two products are radically different.

On the dietetic value of refrigerated foods, S. Rideal (*Cold Storage and Ice Trade Jour., 36 (1908), No. 4, pp. 32, 33*).—Various questions connected with the cold storage of meats and fish, dairy products, and fruit are discussed in the paper which is here summarized. According to the author's experiments on fermentation processes with reference to cold storage, the action of diastase is not entirely prevented by cold but is rendered very slow. The tenderness and maturing of refrigerated meat, according to the author, is attributable not only to the action of sarcolactic acid but also to the gradual and limited work of natural enzyms (pepsin and trypsin), which cause a certain amount of predigestion.

Preservatives in food, W. H. Collingridge (*Meat Trades' Jour., 28 (1908), No. 1075, p. 638*).—Data are reported on the detection of boric acid in samples of sausage in amounts varying from 0.2 to 0.9 per cent. The author points out that the amount taken in sausage might readily be greater than the medicinal dose and also objects to the use of boric acid as a preservative as it permits the utilization of meat for sausage in which putrefactive changes have begun.

Salicylic acid as a preservative, Christian (*Hyg. Rundschau, 18 (1908), No. 22, pp. 1321–1331*).—A summary and discussion of investigations on the use of salicylic acid as a preservative. In the author's opinion, this substance does not ordinarily produce very serious disturbances provided the daily dose is not greater than 1 gm. In the case of persons suffering with kidney disease it is very dangerous, but if the daily amount is very small, namely, under 0.1 gm., he believes that no effect on the normal functions of the body is noted. He points out, however, that there is danger in the use of this preservative, since the total amount obtained per day is unknown and may be harmful.

[Food inspection, etc.], J. Q. Emery (*Semiann. Bul. Dairy and Food Com. Wis., 1908, No. 13, pp. 152*).—In addition to summaries of papers on various pure food topics and legal enactments regarding adulteration, this bulletin reports results of the examination under the pure food law of a large number of samples of canned goods, catsups, cheese, flavoring extracts, sirups, flours, honey, drugs, medicines, etc. Data are also given regarding the creamery and other inspection work.

[Food analyses], J. McCrae (*Transvaal Govt. Labs. Ann. Rpt., 1906–7, pp. 13–15*).—Data are given regarding the examination of blown cans of condensed milk, corn meal, edible oils, and extract of malt. The extract of malt was found to contain 9.28 per cent of proof spirit.

Food analyses, C. F. Juritz (*Rpt. Senior Anal. Cape Good Hope, 1907, pp. 87–97*).—The materials analyzed under the food and drug law included milk and milk products, vinegar, brandy, whisky, etc. A number of general food analyses were also made including among others wines, spirits, lime juice, bush tea, "mealina," and American and colonial meal.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 97, pp. 2; 98, pp. 2; 99, pp. 2; 100, pp 2; 101, pp. 2; 102, pp. 2; 103, pp. 2*).—The subjects taken up are "soaked curd" cheese, the labeling of whisky compounds, change in form of guaranty legend, bleached flour, benzoate of soda, entry of vegetables greened with copper salts, and the labeling of turpentine.

Notices of judgment (*U. S. Dept. Agr., Notices of Judgment 28–35, pp. 13; 36, 37, pp. 7*).—The subjects included are the adulteration of milk, the adulteration and misbranding of pepper and buckwheat flour, and the misbranding of drug products, maple sirup, canned peaches and canned apples, and blackberries.

The revised food and drug regulations of the Louisiana State Board of Health, and food standards (*New Orleans: Board of Health, 1908, pp. 64*).—The full text of the food and drug law of Louisiana as revised to October 21, 1908.

Labels and rulings, E. F. Ladd (*North Dakota Sta. Spec. Bul. 8, pp. 3*).—The resolutions adopted September 29 and 30, 1908, by a conference representing several northwestern States and this Department are reported. The work of the conference was to secure "harmony of action as to rulings, standards and principles, and to promote the uniform enforcement of the food laws and cooperation among food officials of the States of the Middle West."

Model food law bill, E. F. Ladd (*North Dakota Sta. Spec. Bul. 10, pp. 11*).—A copy is presented of a draft of the pure food law suggested by a committee appointed at the meeting held at Mackinac Island, Mich., August 4–7, 1908, of the Association of State and National Food and Dairy Departments to draft a bill which could be used as a general law in the several States and Territories, and also a draft of a bill prepared by a similar committee providing for the sanitary inspection of all establishments or other places where food is prepared or distributed.

Proposed uniform food law for the States (*Amer. Food Jour., 3 (1908), No. 12, pp. 1–9*).—The text of a food law proposed by the committee referred to above.

Report of the proceedings of the twelfth annual convention of the Association of State and National Food and Dairy Departments (*Amer. Food Jour., 3 (1908), No. 8, pp. 1–12, figs. 17*).—This report contains a list of officers and an account of the proceedings of the 1908 meeting, the recommendations and resolutions, and similar data.

Meat inspection and legislation on this subject, H. Martel (*Rev. Soc. Sci. Hyg. Aliment., 6 (1908), No. 1, pp. 39*).—A summary of legislation on this subject at present in force in France and a plea for additional legislation which the author believes is needed.

Practical hygiene, Alice Ravenhill (*Leeds and Glasgow [1907], pp. VIII+744, figs. 139*).—This volume, which is designed for school use, contains chapters on the composition of foods, the effects of cooking, milk and the feeding of infants, tests for the quality of foodstuffs, methods of food preservation, personal hygiene, and a study of soils, building materials, ventilation, etc., with reference to dwellings, as well as chapters on the requirements of life and the human body, etc. Directions are given for experimental work in connection with the various chapters. A bibliography, glossary, and index are appended.

Investigations of foot racers and bicycle racers, W. Pfeiffer (*Berlin. Klin. Wchnschr., 45 (1908), No. 3, p. 93; abs. in Zentbl. Gesam. Physiol. u. Path.*

(*Stoffwechsels, n. ser., 3 (1908), No. 22, pp. 856, 857*).—According to the author's investigations, bicyclists endured a long race better than pedestrians. In the case of the pedestrians no differences were observed which could be attributed to vegetarian or to ordinary diet or to training or lack of it.

ANIMAL PRODUCTION.

The self-heating of hay. H. Miehe (*Die Selbsterhitzung des Heues. Jena, 1907, pp. 127, figs. 45; rev. in Zentbl. Physiol., 22 (1908), No. 17, p. 536*).—With a specially constructed apparatus the author conducted experiments which led him to conclude that the self-heating of hay is a bacteriological and not a chemical process as suggested by Boekout and De Vries (E. S. R., 17, p. 1001). The principal organisms concerned in raising the temperature to 40° are *Bacillus coli* and *Oïdium lactis*. Above 40° *B. calfactor* is most abundant and thrives the best at about 60° C. Other species present depend somewhat on the nature of the plants composing the hay. During the heating process many vegetative and spore forms of molds and bacteria are destroyed.

Analyses of [South American] food and forage plants. G. D'Utra (*Bol. Agr. [São Paulo], 9. ser., 1908, Nos. 7, pp. 521–541; 9, pp. 683–695; 10, pp. 786–797*).—Analyses are reported of 434 grasses, legumes, and other plants made between 1898 and 1907 from specimens collected about São Paulo. The analyses include the calculated digestible nutrients, and in most cases the manurial constituents.

Australian pasture herbs. F. Turner (*Sydney Morning Herald, 1907, July 11; Roy. Bot. Gard. Kew, Bul. Misc. Inform. 1909, No. 1, pp. 12–16*).—This article consists of brief notes on the economic value of Darling clover (*Trigonella suavissima*), *Erodium cygnorum*, *Geranium dissectum*, pigweed (*Boerhaavia diffusa*), mustard, nardoo (*Marsilea drummondii*), native carrot (*Daucus brachiatus*), native lucern (*Psoralea tenax*), native plantain or wild sago (*Plantago varia*), parakeelya (*Calandrinia balonensis*), and warrigal cabbage (*Tetragonia expansa*).

Commercial feeding stuffs. J. E. Halligan (*Louisiana Stas. Bul. 114, pp. 3–255*).—During the season of 1907–8 the station analyzed 8,615 samples of commercial feeding stuffs under the State feed-stuff law, comprising cotton-seed meal, cotton-seed feed, rice bran, rice polish, wheat bran, wheat products, molasses feeds, corn chops, corn and oat feeds, hominy feed, feed meals, brewers' grains, poultry feeds, beef scrap, blood meal, and commercial mixed feeds.

The samples of cotton-seed meal examined carried in general a high protein content, but this varied from 32.06 per cent to 50.88 per cent. The percentage of fat varied from 3.64 to 17.15. Of 800 samples examined, 103 were below guaranty in protein, 347 in fat, and 353 in carbohydrates.

The quality of rice bran seemed a little higher than the previous year. It is pointed out that many adulterated rice brans reach the guaranty yet may be injurious to the digestive organs of the animal to which they are fed if the percentage of hulls is high.

"There has been some trouble experienced with molasses feeds this past season, due to decomposition. Some of the samples contained lumps of molasses showing that they were not well mixed. Unground weed seeds were found in some shipments. These are objectionable, as they sometimes pass through the animal undigested and so they are a source of disseminating weeds. . . .

"Care should be exercised in keeping down the moisture content, as an excess of moisture tends to promote decomposition. The purchaser should avoid shipments that are not in good mechanical condition and feeds that smell rancid and contain over 12 per cent of moisture."

Many corn and oat feeds contained oat hulls and most of them showed the presence of salt. Of the 640 samples examined, 402 were below guaranty in fat.

Analyses of ground corncobs, corn bran, oat hulls, wheat screenings, cotton-seed hulls, and rice hulls, which are common adulterants of feeding stuffs, are also given. A method of figuring rebates on commercial feeding stuffs is described.

Investigations of feeding stuffs, H. IMMENDORFF (*Ber. Landw. Vers. Stat. Univ. Jena, 1907, pp. 10–14*).—This report contains analyses of 374 samples of cotton-seed meal, peanut meal, palm meal, linseed meal, rice feed meal, dried brewers' grains, and sesame meal.

Inspection and regulation of feeding stuffs, W. KINZEL (*Vrtljschr. Bayer. Landw. Rat., 13 (1908), No. 2, Sup., Beilage 3, pp. 35–59*).—There were inspected 2,526 samples of feeding stuffs, nearly double the number of the previous year. A large percentage were found to be adulterated.

St. John's bread, a competitor of molasses feed (*Deut. Zuckerindus., 33 (1908), No. 49, p. 956*).—A note on the increased use of this feed in Germany. Analyses are given.

The Roseworthy Agricultural College flock in 1907–8, A. J. PERKINS (*Jour. Dept. Agr. So. Aust., 12 (1908), Nos. 1, pp. 10–25; 2, pp. 111–128; 8, pp. 227–250. figs. 7*).—A report of experimental work to ascertain what number of live stock can be kept under average conditions, with a view to improving the yielding capacity of the land. The number of acres used, including buildings, yards, and roads, was 1,434, and the average stock kept for the year 43 horses, 70 cattle, 290 pigs, and 1,382 sheep. Pastures were used each month, and rotation of pastures is recommended. Rooted perennials like Golden Crown grass or perennial rye grass are recommended for green feed for early lambs. A field of 43 acres of rape carried an average of 3½ sheep to the acre for the year, and a field of 60 acres of barley stubble carried an average of 4⅓ sheep per acre. Properly managed it is believed that a 3-year rotation of bare fallow, wheat, and grazing should carry 1 sheep per acre for the year, and that only one-fifth of the total area need be thrown open to grazing.

"Catch crops will never involve us in much expense. For the most part they will call for no more than slight early autumn tillage of cereal stubbles and the broadcasting of such crops as rape, mustard, crimson clover, sulla, and perhaps vetches either alone or in combination with one of the cereals. Fallow crops, on the other hand, will always involve us in far greater preparatory expenditure, a portion of which, however, must be borne by the cereal crop that follows. Some of these fallow crops render necessary early autumn plowing, a heavy and laborious task when the land lies hard and dry; of such are kale, kohl-rabi, and perhaps turnips. . . . On the other hand, we have fallow crops that can be sown later in the season when wheat-seeding operations have been completed. For instance, such as peas, vetches, mustard, and perhaps turnips. . . . Fallow crops of this kind involve us in less expense than those previously referred to. Finally, we have the spring-sown summer crops such as sorghums, millets, maize, etc., of greater use on the whole for ensilage purposes and to dairy cattle than to a flock. . . . Whatever is done in this direction it is well to recollect that no forage crop can be raised to any advantage that does not dovetail in with the general economy of the farm practice of the district."

With various crosses of sheep it was found that the largest sheep did not make as good use of what pastures were available as the smaller, but more compact, Merino-Southdown. Slightly heavier fleeces were obtained, on an average, from 162 Merino-Shropshire ewes than from 502 pure Merinos. There was no pronounced difference in the weight of the fleece whether the ewe bore

a pure Merino or a half-bred lamb. Tables are submitted showing the development of lambs of the various crosses.

"It is not necessarily the lambs dropped earliest in the season that are heaviest in early spring. Particularly was this noticeable in 1907 in the case of half-bred Dorset-Horn lambs. Thus, with them we find the heaviest lambs of September 5 represented by those dropped between May 11 and 23 attaining at this time 78¾ lbs., while those dropped between April 21 and May 10 come second with an average weight of nearly 77 lbs., while those dropped between April 10 and 20 come third on the list with only 73¼ lbs. of average weight. With a half-bred Shropshire we find the lambs dropped in the second period about ¼ lb. ahead of those dropped in the first period, while lambs of the third period are a long way behind either of the former. With the half-bred Southdowns, on the other hand, the average weight of the lambs is always directly proportional to the length of their days. . . . Short-wool crosses, Merino crossed with Dorset-Horn, or Merino crossed with Shropshire, and perhaps the smaller Merino crossed with Southdown, give the best type of ewe for our conditions."

Steer-feeding experiments 1907–8, T. I. Mairs and W. H. Tomhave (*Pennsylvania Sta. Bul. 88, pp. 3–20, figs. 6, charts 2*).—To secure data as to the best ratio of total dry matter to digestible matter the authors compared, with 2 lots of 12 fattening steers, a limited grain ration with a full grain ration, each being fed in connection with corn silage, mixed hay, and corn stover for roughage. The experiment began October 30 and ended February 6.

"Both lots received the same kind of feed, consisting of broken ear corn and cotton-seed meal as concentrates, corn silage in the morning, and in the evening mixed hay to December 12, and corn stover from that time to the close of the experiment. Lot 1 received all the ear corn they would eat, while lot 2 received about two-thirds as much as lot 1. Lot 1 received 2 lbs. of cotton-seed meal per steer per day and lot 2, 2.25 lbs. It was the intention to feed lot 2 twice as much corn silage as was fed to lot 1 when on full feed. Lot 2 was given all the corn silage they would eat with a limited grain ration. Lot 1 was given all the corn they would eat with a limited silage ration. The intention was to so apportion the feed that the 2 lots would get the same amount of digestible matter, but lot 1 should receive the more concentrated ration—that is, lot 2 should receive the greater amount of dry matter."

The average daily gains per head were for lot 1 2.06 lbs., and for lot 2 1.87 lbs. The first 2 weeks lot 2 lost in weight, due to the change in feed. After that the gains of both lots were uniform.

"When corn silage forms a considerable portion of the ration of fattening steers more care is required in getting them on full feed than when a dry ration is fed exclusively, or silage is fed in small quantities.

"Slaughter tests failed to show any difference in the carcasses of the two lots that might be attributed to the difference in the feed.

"At the prices for feed named in this article the steers receiving the smaller amount of dry matter made the more economical gains."

Work on the effect of shelter was continued (E. S. R., 19, p. 674) with 2 lots of 12 steers each. Steers in an open shed made practically the same gain during the feeding period, November 13 to March 19, as those in a well-ventilated barn, but ate slightly more roughage.

Rolled oats as a substitute for milk in calf feeding, J. Michels (*North Carolina Sta. Bul. 199, pp. 12–16, fig. 1*).—An experiment lasting 13 weeks was made to compare cooked rolled oats with skim milk as a feed for calves. Nine calves fed the rolled oats made an average daily gain per head of 1.143 lbs., whereas 2 calves fed the skim milk made an average daily gain per head of 1.21 lbs. "On the basis that 1 lb. of rolled oats is equal to 1 gal. of whole milk,

and that whole milk is worth 8 cts. per quart to milkmen, the cost of the milk for a 13-weeks-old calf receiving no rolled oats is $26.96. When roller oats (which cost 4.4 cts. per pound delivered in barrel lots) are substituted for milk as shown above, the cost of the calf feed for the same period is only $12.46, a saving of $14.50 in favor of the rolled oats."

A summary of reports on feeding experiments with diastasolin (*Milch Ztg., 37 (1908), No. 47, pp. 553, 554*).—These results indicate that diastasolin may be used to provide a cheap substitute for whole milk in calf feeding.

Outlook for the beef industry in Canada, J. H. Grisdale (*Farmer's Advocate, 43 (1908), No. 846, pp. 1889, 1890, figs. 5*).—A general discussion of this subject. The increase in the dairy industry has led to the use of dairy sires and has retarded the beef industry. The possibilities of the business west of the Great Lakes are deemed enormous wherever there is a butter market. Packing plants in Montreal or Toronto would help the situation.

The wool industry and its improvement, H. Geldard (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 15–20, pl. 1, fig. 1*).—Suggestions are given as to improving the quality of Australian and South African wools.

Causes of the heavy loss of lambs in 1908, W. J. Quick and A. P. Spencer (*Virginia Sta. Bul. 178, pp. 57–74, figs. 7*).—This bulletin contains statistics of the sheep industry in Virginia and reports the results of an inquiry into the causes of a heavy loss of lambs during the lambing season of 1908.

"In 73 flocks visited 961 lambs were lost out of 5,252 dropped, or 19 per cent. In 65 flocks reported by letter, 1,478 lambs were lost out of 8,068 dropped, or 18 per cent. Figuring on this basis for the State as a whole, 70,147 lambs, valued at $350,375, were lost in Virginia during the lambing season of 1908. The estimated loss from natural and unpreventable causes was 14,029 lambs, valued at $70,145. The estimated loss from preventable causes was 56,118 lambs, valued at $280,590. . . .

"The losses were due to the following causes: Cold and exposure, 40 per cent; lack of milk, 31 per cent; weakness, 9 per cent; disease and accident, 3 per cent; worrying by dogs, 1 per cent; natural causes, 16 per cent."

Suggestions are also presented for the proper care of ewes before and after lambing and on the general management of sheep.

Goat breeding, E. Bödeker (*Ziegenzucht. Hanover, 1907, pp. VI–51, figs. 13*).—This is a brief treatise on the breeding, feeding, and management of goats.

Foods supplementary to corn in fattening pigs, E. A. Burnett (*Nebraska Sta. Bul. 107, pp. 3–10*).—A continuation of work previously noted (E. S. R., 18, p. 570).

In 1906–7 four lots of 4 Duroc-Jersey pigs, kept in a hog house, were fed a basal ration of corn meal. Lot 1 received no supplementary ration and made a daily gain per pig of 0.95 lb., at a cost of 4.66 cts. per pound. Lot 2, fed corn and shorts 3:1, made a daily gain per pig of 1 lb. at a cost of 4.43 cts. per pound. Lot 3, fed corn and tankage 9:1, made a daily gain per pig of 1.1 lbs., at a cost of 4.27 cts. per pound. Lot 4 was fed corn and ground bone 9:1 and gained per pig per day 0.95 lb., at a cost of 4.6 cts. per pound.

In 1907–8 the experiment was repeated, except that the pigs were kept in alfalfa pasture. The average daily gains per pig were, for lot 1 0.98 lb., lot 2 0.97 lb., lot 3 1.18 lbs., and lot 4 1.01 lbs. The average cost per pound of gain was, respectively, 2.38, 2.64, 3.19, and 2.72 cts. A fifth lot, fed corn meal and steamed ground bone 9:1, gained 0.97 lb. per pig per day, at a cost of 2.62 cts. per pound. When the same rations were fed to pigs in a dry lot, the average daily gains per pig were, respectively, 1.06 lbs., 1.09 lbs., 1.36 lbs., 1.19 lbs., and 1.09 lbs. The average cost per pound of gain was, respectively, 3.88, 4.18, 4.87, 4.10, and 4.17 cts.

"Corn is the cheapest ration fed, corn and shorts being second, corn and tankage third, corn and steamed ground bone fourth, and corn and skim milk fifth in cost of production at the prices for feed used in this bulletin. . . .

"It will be noted that where supplementary foods were used, the hogs generally made more rapid gains and reached heavier weights in a given length of time, so that they were ready for the market at an earlier age. This point is a distinct advantage, since it shortens the period of risk and increases the profit per day on each pig."

The effect of food on breaking strength of bones. E. A. BURNETT (*Nebraska Sta. Bul. 107, pp. 11–39, figs. 9*).—Using the pigs under test in the feeding trials noted above, a test was made to determine the effect of different rations on the breaking strength of bones in growing pigs. The average breaking strength of all the bones per 100 lbs. live weight at the time of slaughter of the 16 pigs used in the work of 1906–7 was for lot 1 281 lbs., lot 2 311.75 lbs., lot 3 413.75 lbs., and lot 4 467.75 lbs. The average breaking strength of all bones per 100 lbs. live weight for the 20 pigs used in 1907–8 was for lot 1 325 lbs., lot 2 396 lbs., lot 3 509 lbs., lot 4 580 lbs., and lot 5 681 lbs.

"The laboratory examination of these bones reveals a marked difference in fifth in cost of production at the prices for feed used in this bulletin. . . .

"The laboratory tests have also shown that there is no apparent increase in the external measurements of the bones resulting when protein or mineral matter is added to the food nutrients, but that these additional nutrients, so far as they are assimilated, have greatly added to the thickness of the bone walls by accretion on the inner surface of these walls, thereby reducing the marrow within the bones.

"The thickness of the bone wall increased about 50 per cent in those fed bone meal over those fed only corn. The percentage of mineral matter and the specific gravity in the green bones increased in nearly the same proportion as the thickness of the walls.

"That foods rich in phosphates and mineral matter will increase the strength of bone is conclusively proven.

"There can be no doubt about the advantage of feeding a sufficient amount of phosphates to build up strong, healthy bones, and a deficiency of phosphates during the growing period may materially effect the development of the growing animals. Bone meal and tankage may often be fed economically and the additional cost, if any, can profitably be incurred in the production of high-class breeding animals.

"That an excess of mineral matter in the food may cause mineral matter to be deposited in the bones in excess of that actually needed for the healthy growth of the animal is also quite possible, though not yet proven.

"That such food will cause the animal to stand up squarely on his pasterns is not yet proven. It would seem that the conformation of the pastern will have most to do with this. Strong-boned pigs with short, upright pasterns will be most likely to grow out with good feet, while pigs with long or oblique pasterns will generally go down. Excessive weight at early ages will affect all pigs unfavorably, and lack of exercise is also detrimental."

Weighings and measurements of a number of bones showed that the nature of the feed has no distinct effect upon the length, circumference, or volume of the bone. "The first two lots [in 1907–8], which were fed only corn or corn and shorts, had bones of less weight, of lower specific gravity, with thinner walls, and with a much lower content of mineral matter than those of the three other lots. These properties were characteristic of the entire bones as well as of the portions of the shafts where the fractures appeared when the strength was

being determined. . . . It is apparent that the strong bones have both thicker walls in the shaft and more mineral matter in the ends."

Comparative experiments with swine of different breeding (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *64* (*1908*), *pp. 239*).—The experiments here reported were in continuation of work previously noted (E. S. R., 11, p. 68), and commenced in 1899 and continued for 7 years. The object was to compare the Yorkshire and Danish breeds and crosses between Danish sows and Yorkshire boars as to the period required to reach slaughterhouse weight and the utilization of the feed eaten by the swine. It was also the plan to study for these breeds the bodily conformation of the animals, the deposition of fat, and the quality of the pork as an export article. The report includes experiments with 1,083 different animals, separated into 202 lots, viz, 21 Yorkshire lots, 121 pure Danish lots, 56 first crosses, and 4 lots of mixed breeding.

The main results of the investigation may be briefly stated as follows: The Yorkshire pigs required a little more feed for the production of a pound of pork than the cross-bred pigs and these again slightly more than the Danish pigs. The Yorkshires gave a larger proportion of export pork than the Danish pigs for the same live weight and less shrinkage at slaughtering. They also scored higher in regard to deposition of fat, depth of body, form of hams, and fineness of bone and skin, the crosses coming second with regard to these points. Within the Danish breed there were considerable differences between the different lots as to thriftiness and quality, but by separating these into families it was found that for families where a sufficient number of different lots from each generation had been included in the experiments to enable one to judge of the thriftiness and quality of the separate generations, there was nearly always an indication that the feed consumption for a certain gain in live weight was increasing from generation to generation. In the same way the percentage of shrinkage at slaughtering was increasing, while the percentage of export pork was decreasing to the same extent with each generation. On the other hand, in the scores for the quality of bacon, depth of body, form of hams, and fineness of bone some progress was to be traced from one generation to another.

The feed consumption per pound of increase in live weight in the experiments here reported was found to average for lots weighing from 35 to 75 lbs. per pig, 3.4 lbs.; for lots weighing from 75 to 115 lbs., 3.8 lbs.; and for lots weighing from 115 to 155 lbs., 4.4 lbs. The lower consumption of feed per gain in live weight in the experiment here reported as compared with the earlier experiments is considered to be explained partly by the fact that nearly all of the former experiments were conducted during the summer and partly by an improvement in the average quality of the animals experimented with.

Pork production in Denmark (*Bul. Mens. Off. Renseig. Agr.* [*Paris*], *7* (*1908*), *No. 10, pp. 1254–1256*).—Statistical information on the recent development of the swine industry in that country.

The horse: Its selection and purchase, F. T. Barton (*London, 1907, pp. X+252, pls. 16*).—"The object of this book is to show buyers of horses what to select and what to reject when purchasing without professional guidance. . . . The chapter on conformation is intended to give the reader a general idea of the good and bad points of the horse." The characteristics of the Shire, Suffolk, and hackney horses are described. There are chapters on unsoundness, general hints relating to buying, and warranty, and examples are given of typical actions at law (English) relating to the sale and purchase of horses.

[The small hunter] (*Mark Lane Express, 99 (1908), No. 4024, pp. 531, 533, fig. 1*).—The author thinks that the short-legged, compact, powerful horse, standing from 15 hands to 15 hands 2½ in. is to be preferred to the larger horse in many places for hunting and for cavalry remounts. It is stated, however, that the economic value of the small hunter is not appreciated by many, as this class seems to be less numerous at shows than formerly.

Notes on horse feeding, A. Fredholm (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 2, pp. 477–501*).—A general discussion of the subject as applied to the local conditions. Analyses of feeds are given.

The use of African elephants for transport service (*Jour. Roy. Soc. Arts, 56 (1908), No. 2915, pp. 977, 978; Sci. Amer. Sup., 66 (1908), No. 1717, pp. 347, 348*).—Experiments at the elephant farm at Api, in the northern part of the Congo Free State, indicate that the African elephant, heretofore considered untamable and valuable only for ivory, may in the future become a valuable means of transportation in regions otherwise difficult of access. European stock does not survive in the tropical heat, and native carriers can be employed to only a limited extent. In the region of vast plains cut by rivers and swampy streams of the Uele district there is an abundance of native grasses to furnish cheap feed for the elephants.

Poultry fattening (*Jour. Nat. Poultry Organ. Soc., 2 (1908), No. 4, pp. 114, 115, pl. 1*).—A discussion of the conditions of this industry in Sussex, England. As a rule, poultry fatteners do not breed the birds themselves. The supply of suitable birds for fattening is inadequate. For a time this deficiency was made up by supplies from Ireland. It is hoped that the increase in the number of small holdings throughout the county will relieve the present shortage of fowls for the fattening pens.

The marketing of poultry (*Bd. Agr. and Fisheries [London], Leaflet 201, pp. 4*).—The methods of preparing poultry for the English markets are described.

Some ostrich food plants, J. Burtt-Davy (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 49–60, pl. 1*).—An account of methods of feeding ostriches as practiced in the eastern provinces of Cape Colony, with descriptions of native and introduced grasses and other food plants adapted for ostrich feeding.

The preservation of eggs in the Tropics, J. Vosseler (*Pflanzer, 4 (1908), No. 9, pp. 129–136*).—Eggs kept in plant materials such as chaff, straw, etc., had a musty odor and taste which develops rapidly in moist, tropical climates. Dry sand gave much better results. Lime-water made the shell brittle and the albumin disappeared so that the egg could not be whipped. Collodion, shellac, varnish, gum arabic, and glue were tried but were less satisfactory than potassium permanganate or a mixture of glycerin, alcohol, and water. The best results were obtained with water glass. Eggs so preserved kept for over a year.

Improved egg preservation, J. G. Stephens (*Daily Consular and Trade Rpts. [U. S.], 1909, No. 3377, p. 16*).—By immersing eggs in a vessel of hot paraffine wax in a vacuum the air in the shell is extracted and the hot wax pressed into the pores of the shell, thus hermetically sealing it. It is claimed that eggs so treated will retain their new-laid freshness for 6 months.

Insurance of live stock [in the different European countries] (*Jour. Bd. Agr. [London], 15 (1908), Nos. 1, pp. 32–44; 7, pp. 523–526; 8, pp. 572–579*).—General information on insuring stock and methods of establishing live stock insurance societies in Holland, Belgium, France, Switzerland, Germany, Sweden, Denmark, Norway, and Great Britain.

DAIRY FARMING—DAIRYING—AGROTECHNY.

[Feeding experiments with cows], J. MICHELS (*North Carolina Sta. Bul. 199, pp. 5–12*).—Corn stover of rather inferior quality was compared with cotton-seed hulls as a roughage for milk production when fed with a grain ration consisting of cotton-seed meal, dried brewers' grains, and linseed meal 4:2:1. Seven cows were used for the experiment and the feeding periods lasted 22 days, exclusive of the preliminary feeding.

"Averaging the results of the 2 stover periods, . . . the cows yielded 2,482 lbs. of milk during the stover period against 2,414.4 lbs. for the hull period. Similarly, the cows during the stover period yielded 116.2 lbs. of butter fat as against 116.5 lbs. for the average of the hull periods, showing in this experiment that cotton-seed hulls and corn stover had practically equal value as milk and butter fat producers. . . . On the whole it may be concluded that the cotton-seed hulls and corn stover used in the experiment had about equal value in maintaining the live weight of the cows. . . . Aside from their low nutritive value, cotton-seed hulls do not seem very well suited for dairy cows, on account of their low palatability and digestibility. With the cows used in these experiments it was found that a majority refused the hulls when they were offered them unmixed with concentrated feeds. When mixed with the concentrates the cows would eat them, largely because they were obliged to do so in order to get the concentrates. On general principles it can not be considered good feeding to thus force cows to swallow a lot of unpalatable material, especially when such material has such a low digestibility."

In another experiment 6 grade cows, from 3 to 4 weeks in lactation, were used to compare corn meal with a mixture of corn meal and dried brewers' grains in equal portions as a supplement to cotton-seed meal for milk production. The feeding periods were 21 days each. The average yield for the 2 periods in which corn meal alone was fed was 2,933.1 lbs. of milk, and for the period when the mixture of corn meal and brewers' grains was fed, 2,859.5 lbs.

The Canadian record of performance for pure-bred dairy cattle (*Canada Dept. Agr., Branch Live Stock Comr. Rpt. 1, pp. 32*).—This contains the rules and regulations of standards for registration of the Ayrshire, French-Canadian, Guernsey, Holstein-Friesian, and Jersey breeds. Details of yields of pure-bred Canadian cows, which have been admitted to the advance registry, are included.

Improvement in dairy herds, P. J. CARROLL (*Jour. Dept. Agr. Victoria, 6 (1908), No. 10, pp. 597–604*).—The author calls attention to the low yields of the average cows, and outlines a scheme for forming cow-testing associations.

The dairy institutes in Germany, WEIGMANN (*Illus. Landw. Ztg., 28 (1908), No. 87, pp. 749–751*).—A brief history of these institutions and their significance.

Milking machines, A. L. HAECKER and E. M. LITTLE (*Nebraska Sta. Bul. 108, pp. 3–73, pl. 1, figs. 4*).—The milking machine in use at the station is described and the results of various tests with the university herd are reported.

Tables are submitted which show the effect of the machine upon the yearly records of 20 cows. In at least one case the lactation period was shortened by the use of the machine. The amount of strippings left to be drawn by hand was very low, averaging about 3 per cent. Six cows milked out perfectly clean during the entire lactation period. "The average amount of strippings from the entire number of cows was only 220.7 lbs. This is less than 0.75 lb. each day per head. This item is significant only when we consider the performance of individual cows and when we learn that in almost every case the period when

strippings were obtained covered but a month or two during the entire lactation." In a few cases the amount of strippings was considerable. In one case there were 790.2 lbs. of strippings from one cow during 315 days. The machine was unable to draw the milk satisfactorily from another cow because of a peculiar shaped udder. The cost of repairs and supplies of the milking-machine equipment and 3 milkers for 2 years was $88.97.

The effect of alternate hand and machine milking was tried with 2 cows, but the results were not satisfactory. "When machine milking and hand milking are carried on irregularly and interchangeably the machine will not draw all the milk and in consequence more strippings are obtained. It is very evident that we can not make a comparison between two methods of milking by alternating these methods." In the case of hard milkers the sphincter muscle at the end of each teat was treated with a dilator until the milk could easily be drawn by hand, yet the machine was unable to remove the milk. The teat cups and mouthpieces need to be changed as the lactation period advances.

An average of 6 milkings required 67 minutes to milk 20 cows, producing 157.7 lbs. of milk, 29.5 of which was removed in the strippings, which required 24 minutes. In this case three machines were operated by one man. In another test 12 cows were milked in 92 minutes with one milker. The quantity of milk did not materially influence the time required in milking.

The bacterial content of milk drawn by hand was compared with that drawn by machine. "The average count in the case of the 3 samples of machine-drawn milk shows 37,090 bacteria per cubic centimeter of milk, while in the hand-drawn milk there are but 3,310 in each cubic centimeter." When the machine parts were thoroughly washed, scrubbed, and steamed for 20 minutes each morning and at night rinsed in three waters and submerged in limewater the bacterial content was slightly less in the machine-drawn milk than in the hand-drawn milk.

"The relief filters attached to the milkers when neglected are a continual source of contamination. Air rushes in through these openings to relieve the vacuum caused by each pulsation of the machine and unless protected each inflow of air will carry bacteria with it. This is especially true of the connector relief filters which are suspended but a few inches above the floor while the machine is in operation. During the time of the experiments cited here absorbent cotton was placed in each relief just before milking. The use of these wads of cotton checks contamination from this source entirely, as they stop and hold all bacteria.

"For soaking the tubing, lime has been used in every trial on account of its antiseptic properties and convenience. Other agents, such as formaldehyde, would have undoubtedly given better results as their germicidal properties would aid greatly in reducing the number of bacteria, but the use of a substance of this nature is questionable if not dangerous and could not be recommended for general use. The limewater used for this bath should be renewed every 4 or 5 days. If the antiseptic is to be of any benefit in preserving the rubber and in retarding bacterial growth it must come in contact with every part of the tubing. . . .

"Heifers in their first lactation apparently give better results by machine milking than do aged cows that have been accustomed to hand milking for one or more years.

"Some cows are not adapted to machine milking.

"Manipulation of the udder is absolutely necessary in some instances before all the milk can be drawn by the machine.

"Two men operating 4 machines can practically do the work of 3 men milking by hand.

"The man operating the milkers must thoroughly understand the care and management of dairy stock. He should also be persistent in the attention to details in order to obtain the best results.

"From these studies it would appear that the milking machine is fitted for large herds rather than small ones, and we believe it would be impracticable to install them where fewer than 30 cows are milked the year round."

Tables give the individual records of the different cows used in the experiments. From answers to questions received from 11 of the 13 milking plants in the State it is apparent that the milking machine is meeting with different degrees of success in the hands of practical dairymen and farmers. The reports are not enough alike to permit of a definite conclusion to fit all conditions, but they show what may be expected of the machine milkers under various conditions and in the hands of different men.

[The milk bottle question] (*Maritime Farmer, 14 (1908), No. 4, pp. 70, 71*).—The advantages and disadvantages of paper milk bottles are discussed. The author thinks that the use of paper bottles would reduce the cost of delivering milk and that there would also be less danger of spreading communicable diseases.

A note on the bacterial contamination of milk as illustrating the connection between flies and epidemic diarrhea, J. T. C. Nash (*Lancet [London], 1908, II, No. 23, pp. 1668, 1669*).—Milk exposed to flies for 5 hours on a warm day contained about 3,500,000 more of gas-forming bacteria per cubic centimeter than the same quality of milk when kept covered. The chemical changes produced by such large numbers of putrefactive bacteria "may conceivably be very prejudicial and excite acute diarrhea."

The bacterial flora of milk, G. Koestler (*Käsereitech. Rundschau, 1907, Oct.; abs. in Milchw. Zentbl., 4 (1908), No. 8, pp. 379–381*).—For practical purposes the author divides milk bacteria according to their ability to decompose lactose, casein, and fat. Those which attack lactose are subdivided according to the decomposition products, namely, acid-forming, gas-forming, and those which form other substances. For cheese makers the fermentation test is stated to be the only practical method for determining whether or not the desired kinds of bacteria are present.

The bacterial flora of Cheddar cheese, H. A. Harding and M. J. Prucha (*New York State Sta. Tech. Bul. 8, pp. 121–193, dgms. 11*).—This bulletin reviews recent studies of the bacterial flora of Cheddar cheese, and reports the results of a quantitative and qualitative study of the flora in 9 normal Cheddar cheeses during the ripening period.

"More than 300 pure cultures were isolated and finally reduced to 33 groups according to the classification of the Society of American Bacteriologists. Ten of these groups disappeared from the cheese at once; representatives of 9 other groups were found in but single cheeses, although each group persisted for some time in the cheese where found; the remaining 14 groups are the most important members of the cheese flora. The *Bacterium lactis acidi* of Leichmann, which includes 4 of these 14 groups, is the only species which was always found and it practically always included over 99 per cent of the total germ content.

"The initial flora of milk varies widely, depending upon its environment. When this milk is made into cheese the accompanying changes in temperature, moisture, and acidity induce a rapid shift in this flora, . . . and some of the forms which grow best in milk are lost before they can be observed, for they will not grow on any culture media now in use." As the whey is expelled from the coagulated mass it does not contain its volumetric proportion of the germs previously found in the milk. No data are given on the freshly coagulated curd.

The results obtained from a study of individual cheeses during ripening are presented in tabular form. "In different cheeses the rate of increase, the maximum germ content, and the age at which it is obtained, as well as the rate of decline after this point, varied greatly. The causes of these variations are only partly understood. . . . The lowest recorded maximum, 27,000,000, and the highest, 178,000,000 per gram are in the 2 cheeses having a very similar qualitative flora and ripening in a similar manner. The rate of ripening in these 2 cheeses was slightly different, the one with the highest maximum germ content ripening more slowly." The average germ content of all the cheese examined was 10,000,000 per gram at the end of 5 hours, 30,000,000 at the end of 1 day, 40,700,000 at the end of 10 days, 10,200,000 at the end of 50 days, 2,625,000 at the end of 100 days, and 500,000 at the end of 150 days.

"The type *B. lactis acidi* makes up 99 per cent or more of the flora of normal Cheddar cheese in practically all cases. The representatives of this type differ in their relation to air and in their ability to attack saccharose, so that they are found under 4 different group numbers. . . . *Streptococcus lacticus*, which includes 2 different group numbers, is occasionally found in much smaller numbers. These groups apparently agree with the corresponding groups of *B. lactis acidi* in everything except morphology. The position taken by Conn, that there is a distinct morphological basis for the separation of the cocci from the rod forms, appears to be well taken. Both the morphology and the physiology of these groups is easily influenced by their environment, and it is especially important that the cultures be brought to a vigorous condition before being subjected to detailed study.

"The acid liquefiers which are considered so important by Gorrini are represented by *Micrococcus lactis albidus* (2 groups), *M. lactis giganteus*, *M. lactis varians* (4 groups), and *M. lactis brevis*. *M. lactis albidus* and *M. lactis brevis* occurred sufficiently often to suggest that they might play some part in the ripening changes. Representatives of this group were found in all but [one cheese]. These forms grew well in the milk but made little headway in the cheese, although they survived there better than the nonacid-producing forms. Their number as compared to the total germ content of the cheese, was relatively insignificant.

"The gas-producing forms, like the preceding group, find the best conditions for their development in the milk and make little or no growth in the cheese. *Bacillus coli aerogenes* was found in the milk [for 2 cheeses]. In both cases it was not found in the cheese after the first day. The isolated cultures were slow gas producers and did not displace more than one-third of the closed arm in the fermentation tube.

"*Bacterium lactis aerogenes* was found in [4 cheeses. When present in considerable numbers] evidence of gas was noted in the vat during the early stages of the making process. These forms are very resistant to the acidity in the milk and cheese, but our data do not show that they multiply in the latter.

"The inert group, characterized by a lack of any apparent action upon milk, is represented by *Galactococcus versicolor* and *B. lactis connii*. They are fairly numerous at times in the milk and fresh curd. They usually disappear quickly. There is no evidence that they increase in the cheese.

"Very few specimens of yeasts have been found, although an effort was made to prepare plates especially suitable to their habits of growth. . . .

"The system of recording the reactions of cultures as proposed by the Society of American Bacteriologists is a marked advance in technique. By its aid the shifts in the cheese flora can be followed with more accuracy than was previously possible. The cultures isolated can readily be so characterized as to be

recognized by succeeding workers. Each investigator can thus build upon what has been done, and a satisfactory acquaintance with such of the flora as will grow on our culture media is possible at no very remote date.

"The quantitative changes observed in 9 normal cheeses, representing 4 commercial factories and our own dairy, agree closely with those previously found in Wisconsin and Canada. Emphasis should be laid upon the fact that first-class cheeses vary widely both in their total germ content and in the age at which the maximum number of bacteria is found. . . .

"The rate of the ripening process seems to be independent of the number of germs present, except that in certain cheeses a flora closely confined to acid-producing forms was coincident with a retarded rate of ripening.

"There is a lack of satisfactory evidence, either in the results from our studies or in those which have preceded them, that any of the forms thus far isolated play an important part in the later stages of the ripening of normal Cheddar cheese. This does not preclude the possibility that such evidence may be later produced nor that important forms may be found which do not appear upon our present culture media."

Stringiness in Emmenthal cheese, J. Hohl and R. Steinegger (*Landw. Jahrb. Schweiz, 22 (1908), No. 5, pp. 272–283*).—The authors have isolated and described a form of *Bacterium güntheri*, which apparently is the cause of stringiness.

Studies on fermented milk. I, Yoghourt and matzoon, W. Kuntze (*Centbl. Bakt. [etc.], 2. Abt., 21 (1908), No. 24–25, pp. 737–768, pls. 3*).—The author calls attention to the great variability of the bacteria found in yoghourt and matzoon by different observers. From his own researches he thinks that some, if not all, of these species described as new are only varieties of species previously known. A complete list of references is appended.

Alcohol industry in Germany, A. M. Thackara (*Mo. Consular and Trade Rpts. [U. S.], 1908, No. 339, pp. 179–182*).—Over 100,000,000 bu. of potatoes are used per year in the manufacture of alcohol in Germany, and in addition a large amount is made from cherries, plums, berries, grapes, currants, raisins, wine, wine lees, fruit and wine cake, rye, barley, wheat, corn, and sorghum. In northern Germany many of the distilleries are owned by the farmers. Few of the farmers' distilleries have rectifying plants, the crude alcohol being usually sold to dealers for rectifying purposes or for denaturing. In southern Germany a large number of small farmers distill alcohol with simple apparatus from fruit and berries that can not otherwise be marketed at a profit.

Micro-photographic atlas of industrially important fibers. I, Vegetable raw material, A. Herzog (*Mikrophotographischer Atlas der Technisch Wichtigen Faserstoffe. I, Pflanzliche Rohstoffe. München, 1908, pp. 80, pls. 46, figs. 14*).—This is a handbook for the microscopic investigations of materials used in the manufacture of textiles, paper, ropes, brushes, etc. The work is published in two parts, the one containing the discussions, descriptions, and bibliography, and the other the micro-photographs of the different fibers considered. The instruments, as well as the reagents, used in studying the fibers are enumerated and described. The classification of fibers is outlined. The different substances used in the manufacture of paper are also considered.

Paper-making materials and their conservation, F. P. Veitch (*U. S. Dept. Agr., Bur. Chem. Circ. 41, p. 20*).—This circular was prepared to furnish information as to the suitability of various products that may be used for paper stock, and contains many suggestions for utilizing waste products. Emphasis is laid on the fact that there are large quantities of waste textiles and paper which might with advantage be employed for paper making. It is estimated that 2,000,000 tons of such waste, worth approximately $30,000,000, can be

secured annually in this country, which would make approximately 1,700,000 tons of paper. Materials that may be used for paper making are classified into four groups; namely, seed hairs, bast fibers, stems and leaves of herbaceous plants, and wood, and the relative quantity and value of these different groups is discussed.

It is stated that the cheapest known raw material for medium grade paper which can be obtained in large quantities is wood. It is estimated that fully 12,000,000 cords of wood are available annually as waste from the lumber industry, besides large quantities from other sources which can doubtless be obtained at low cost for cheaper grades of the product. Straws from oat, wheat, rice, and other cereals make a good quality of paper, but are now being used only in small quantities.

"Malbón or *Malva castilla*, a plant which grows wild over large areas from southern California to southwestern Mexico, is used by the Indians in making cordage, ropes, and coarse fabrics. Examination of the fiber . . . indicates that it will yield about 60 per cent of pulp. The individual fibers are from 0.75 to 6 mm. long, averaging 2 mm., and are suitable for making a strong white paper. . . .

"One of the most striking points brought out . . . in the examination of paper is that the quality of any class is seldom as good as the materials and the technical skill of the maker can produce. . . .

"On the whole it is a conservative statement that the quantity of paper now used in this country can readily be reduced 25 per cent by making from the materials now employed better paper and by using no heavier paper than is required by the service to be performed. . . . Economic agricultural considerations indicate that the cultivated straws should only be employed [for paper making] when the woods and textile and paper wastes can no longer supply the demand or are too costly. Flax fiber, when it can not be put to more important uses, should be employed in paper making."

VETERINARY MEDICINE.

Annual report on the distribution of animal plagues in the German Empire (*Jahresber. Verbr. Tierseuch. Deut. Reiche, 22 (1907), pp. VI+97+176, maps 4*).—This is a report in which the extent and distribution of the important animal diseases occurring in the German Empire are considered, particularly anthrax, symptomatic anthrax, rabies, glanders, pleuro-pneumonia, hog cholera, swine erysipelas, chicken cholera, fowl plague, scab, and influenza of horses. Details concerning the distribution of these diseases in the Empire are also presented in tabular form. Maps are appended showing the occurrence of rabies, glanders, foot-and-mouth disease, and sheep scab in Germany. The meat inspection regulations of Germany are given as are also the laws of the various countries relative to animal diseases.

Veterinary department, 1907, A. Oliver (*Rpts. Finance, Admin., and Condition Sudan, 1907, pp. 837–843*).—The cattle plague which appeared to have been almost stamped out in the Sudan broke out again in the Kassala Province. Sarraja or contagious lymphangitis has become a serious problem over a great part of the Sudan. Trypanosomiasis of all classes of animals is said to be the most serious veterinary question in the province. Biliary fever of the horse and dog and a disease of fowls are transmitted by ticks, the latter causing great loss of poultry in Egypt. Horse sickness was not very prevalent while mange prevailed throughout the Sudan, particularly in baggage camels. Very little progress has as yet been made in the improvement of the local breeds of horses and donkeys.

Tuberculosis in animals and its relation to public health, W. Robertson (*Agr. Jour. Cape Good Hope, 33 (1908), No. 3, pp. 341–357, pls. 2*).—An account is given of the disease with directions for the use of tuberculin. The transmission of tuberculosis through the vehicle of meat and milk is discussed.

Tuberculosis of retropharyngeal lymphatic glands, W. Jowett (*Vet. Rec., 21 (1908), No. 1056, pp. 203, 204, pl. 1*).—Records are reported of 100 consecutive, post-mortem examinations made by the author of cattle which had reacted to tuberculin but which in the majority of cases gave no clinical indication of being the subject of tuberculosis. Thirty-nine of the animals were found to have well-marked lesions in the retropharyngeal glands and in 4 of the 39 animals, although careful examinations were made, no trace of tuberculosis could be detected in any other organ of the body.

The protection of cattle against tuberculosis, J. F. Heymans (*Wiener Klin. Wchnschr., 21 (1908), No. 25, pp. 893–895*).—The author describes a method which he calls the sac method that increases the resistant power of the animal to tubercle bacilli. The sac, made from a reed, is filled with 1 mg. of living tubercle bacilli, diluted with powder. The mouth of the sac is tied and collodionized and the sac is then introduced under the skin of the animal.

A tuberculous cow soon shows a typical reaction when a sac containing 0.5 cc. of raw tuberculin is inserted under the skin. When the sac contains live bacilli they thrive so long as they obtain the necessary nutrient substances by diffusion. The wound heals, the sac forming a nodule resembling a tubercle. Experience shows that an animal bearing one of these sacs is protected against experimental and spontaneous tuberculous infection to an extent hitherto unattained. This method has been applied by the author to 4,000 cattle during the last 3 years. References are given to articles published on the subject by the author.

A new contribution to the study of the vaccination of bovines against tuberculosis, A. Calmette and C. Guerin (*Ann. Inst. Pasteur, 22 (1908), No. 9, pp. 689–703*).—A continuation of experiments on vaccination against tuberculosis previously noted (E. S. R., 19, p. 577).

The authors conclude that by the ingestion of virulent or attenuated tubercle bacilli a relative immunity is produced that will protect from virulent bacilli for 6 months or longer. When from 8 to 12 months after having resisted a massive infection by the digestive tract and supposedly vaccinated, bovines received intravenously a dose of virulent bacilli, it was found that following a short period of discomfort they continued in perfect health for 6 or 8 months. They retain, however, in their bronchial and mediastinal glands, virulent bacilli that will cause tuberculosis in guinea pigs, but will not produce a reaction to tuberculin. After 6 to 8 months more the immunity disappears and the bacilli may produce tuberculous lesions. Tubercle bacilli from cultures introduced by ingestion are after a time resorbed in the mesenteric glands, but are not sufficiently numerous to produce lesions, while by intravenous injection they remained virulent in the lymphatic glands of the thoracic organs.

"Tuberculous animals or those sensibilized to tuberculin by 2 or 3 massive injections of that substance in the veins, offer a very great resistance to reinfections or to severe tuberculous infections, natural or artificial, even if these are made by the intravenous method. . . . Then it is not in any way a true immunity, because the animals, thus vaccinated, although not reacting to tuberculin, remain carriers of living and virulent bacilli which are able, when the resistance diminishes to create in the organism of these same animals serious lesions, and again because, as Roux and Vallée have demonstrated, vaccination by venous or subcutaneous methods does not protect against intestinal infection."

Economics as a positive factor in the dissemination of tuberculosis in animals, O. E. Dyson (*Nat. Provisioner, 39 (1908), No. 20, pp. 19, 37*).—A paper read by the author before the International Congress on Tuberculosis, in which which are discussed the factors that have prevented a more effectual work of eradication. The author considers eradication of the disease in this country to depend upon the enactment and rigid enforcement of Federal laws which will prevent the interstate shipment of any bovine intended for breeding or dairy purposes unless submitted to the tuberculin test and authoritatively certified as being free from the disease.

The control and prevention of bovine tuberculosis in individual herds, V. A. Moore (*Amer. Vet. Rev., 34 (1908), No. 1, pp. 22–29*).—This article forms part of the report of the committee on diseases of the American Veterinary Medical Association.

The author considers that past experience warrants the conclusion that tuberculosis can be practically eliminated from cattle, not by acts of legislation, but by the persistent application of an intelligent system of action that will prevent the further spread of the virus and eliminate as quickly as consistent the animals already infected. While laws will be of assistance, the real results must come from wise, conservative, and scientific advice given by the veterinarian and followed by the individual owner of cattle.

The struggle against tuberculosis in cattle in Denmark, B. Bang (*Vet. Rec., 21 (1908), Nos. 1046, pp. 63–65; 1047, pp. 82–85*).—This is a paper presented at the International Congress on Tuberculosis held in Paris, in 1905.

Suppression of tuberculosis among cattle on the Continent (*Jour. Bd. Agr. [London], 15 (1908), No. 7, pp. 494–502*).—A brief account is given of the work in Sweden, Norway, Denmark, Holland, Belgium, Germany, and France for the suppression of tuberculosis in cattle.

Bang's bacillus and its biology, J. Nowak (*Ann. Inst. Pasteur, 22 (1908), No. 6, pp. 541–556, pls. 3*).—The author here reports experiments carried on with the bacillus which Bang described as the specific agent of epizootic abortion in cows. A method of cultivating this bacillus which the author considers surer and easier to carry out is described. Development has been obtained in an atmosphere of oxygen and in compressed air. The bacillus has lived in a straight gelatin medium for more than 2 years. This viability explains the outbreaks of epidemics in certain stables. The death of the fetus resulted in guinea pigs and rabbits inoculated subcutaneously, intravenously, and intraperitoneally with the bacillus. Neither the ingestion nor the introduction of the bacillus into the vagina produced the disease in these animals. No experiments were made with cows.

A contribution to the study of red dysentery (coccidian enteritis) of cattle, E. Zublin (*Schweiz. Arch. Tierheilk., 50 (1908), No. 3, pp. 123–169, figs. 10; abs. in Vet. Rec., 21 (1909), No. 1072, pp. 487, 488*).—This is the report of an extensive study based upon the literature and the author's experience with the disease in Switzerland. The disease is a febrile epizootic of young cattle that is localized in the large intestine, particularly in the rectum. It is caused by a specific coccidia known as *Coccidium bovis*, which is not found in healthy animals. Though generally terminating in recovery it may cause the death of infected animals.

Three stages of the infection are recognized: (1) The congestive stage in which the feces contain blood coagula and a few coccidia; (2) the stage of hemorrhagic diarrhea accompanied by fever; and (3) the stage of regeneration and abatement and disappearance of the symptoms. Animals are probably infected through solid food or fluids which contain the spores. Direct transmission from animal to animal does not seem likely.

As the parasites are very resistant, treatment is purely symptomatic. The hyperemia is combated by repeated clysters of 1 per cent alum or ½ per cent tannin in solution. Afterwards astringents are given by mouth and cardiac weakness treated with stimulants and the system strengthened by the use of milk and eggs. The author has had recoveries in 95 per cent of the cases. It is said that the meat can usually be used for food.

The nodular disease of bovines an esophagostomiasis, G. Marotel (*Bul. Soc. Cent. Méd. Vét., 85 (1908), No. 18, pp. 457–461, figs. 3*).—Studies have been made of this disease through which it has been determined to be an esophagostomiasis and not an uncinariasis. The life cycle of the parasite has been followed and is here described.

Changes in the blood of parasite-infested sheep on an innutritious diet, W. Giltner (*Amer. Vet. Rev., 33 (1908), No. 5, pp. 557–561*).—Studies made of the blood of sheep infested with *Œsophagostoma columbianum* and *Hæmonchus contortus* are here reported. In the sheep studied the lesions produced by *O. columbianum*, together with the occurrence of the stomach worm in small numbers and a very coarse unbalanced innutritious ration, lessened the vitality of the sheep and led to a fatal issue after producing a marked alteration in the blood. A decided anemia, polynuclear leucocytosis and almost total absence of eosinophiles and mast cells are said to be the characterizing features. It is suggested that the change in the blood may be due to mechanical obstructions by the nodules of the absorption of digested nutrients or even the prevention of digestion.

Does lime and sulphur injure wools more than other dips? S. B. Hollings (*Agr. Jour. Cape Good Hope, 33 (1908), No. 3, pp. 377–382*).—Experiments were conducted with several dips in an attempt to ascertain to what extent if any the wool had been injured by dippings at different stages of growth. Under direction of an authority on wool each lot was scoured separately and treated up to and including the dyeing stage. The expert does not draw a conclusion, but from the detailed results reported, wool from sheep dipped in lime-sulphur appears to compare favorably with that from sheep dipped in Cooper's powder and tobacco extract.

The caustic soda and sulphur dip (*Natal Agr. Jour., 11 (1908), No. 8, pp. 982–985, pl. 1*).—Experiments here reported appear to show that the objection made to the use of this dip on the ground of injuries to the wool are not well founded.

Bovine piroplasmosis observed on the Ivory Coast, G. Bouet (*Bul. Soc. Path. Exot., 1 (1908), No. 4, p. 234*).—Piroplasmosis is reported on the Ivory Coast in cows from Senegal and in bovines, particularly zebus, which had recently arrived from various points of the Sudan or Sahel and which must have there contracted the disease. In all these cases the blood contained more or less abundantly either *Piroplasma bigeminum* or *P. mutans*. Blood from one of the oxen produced the disease when injected into a heifer. At the end of 15 days a Piroplasma of the *bigeminum* type and at the end of 24 days a Piroplasma of the *parvum* type appeared. The presence of *Trypanosoma cazalboui* prevented a report of the pathological effect of the Piroplasma being made. A heifer was also infected by the attachment of ticks, progeny of females taken on a bovine, and again *P. bigeminum* was found.

The value of the agglutination reaction and of bacteriological methods in the diagnosis of glanders, K. R. Collins (*Jour. Infect. Diseases, 5 (1908), No. 4, pp. 401–411*).—The application of this reaction was followed during a period of 2 years in which time 2,500 horses were tested. The results, in the author's opinion, are not sufficiently conclusive from a practical standpoint to make it a means of absolute diagnosis.

"The serum of horses reacting with *Bacillus malléi* in dilutions of 1:1,000 and above indicates a glanders infection which may be latent or active according to the accompanying symptoms and reaction to mallein.

"Horses giving a reaction of 1:500 to 1:1,000 are to be suspected and should be tested with mallein; if no reaction occurs and the horse is apparently in healthy condition, it may be considered free from glanders."

In connection with the experiments reported the author reviews the work of other investigators on the subject.

Lamziekte on the Kaap Plateau, J. Spreull (*Agr. Jour. Cape Good Hope, 32 (1908), No. 5, pp. 588–600*).—It is the author's opinion that the name lamziekte given to this disease by farmers should stand, sanctioned as it is by long usage in Cape Colony, although some writers have used the name pasteurellosis and, according to the type of the disease, it has also been called by several other names. The disease appears to be quite widespread in Cape Colony, being most severe in the coastal districts of the East Provinces, and it is the author's opinion that it must also occur in the Orange River Colony and western Transvaal.

The author has cultivated the organism on artificial media and has found it virulent on inoculation into healthy animals. It conforms in all respects except in its active motility with Lignières's description of the Pasteurella, a cocco-bacillus. The disease appears in a number of forms of which the three more common are the edematous or throat form, the thoracic form, and the paralytic form. An account is given of these forms, of susceptibility, plurality of attacks, post-mortem lesions, treatment, and prophylactic measures. Experiments conducted, including drenching and the injection of body fluids and artificial cultures, are also reported.

Report on swamp fever, J. R. Ballah (*Ann. Rpt. Dept. Agr. Prov. Saskatchewan, 1907, pp. 223–226, pl. 1*).—Attempts to transmit swamp fever by injection of blood, gland juice, or other fluid have been unsuccessful. In the cases examined the liver showed marked inflammatory changes leading in some cases to death of the tissue and formation of new connective tissue. In a considerable proportion of the cases examined special treatment of the tissue revealed bodies in the liver cells which the author believes to be protozoa and probably the specific cause of the disease.

Equine piroplasmosis in Sardegna, A. Baruchello and A. Pricolo (*Ann. Ist. Ig. Sper. Univ. Roma, 18 (1908), No. 2, pp. 307–313, pl. 1; abs. in Bul. Inst. Pasteur, 6 (1908), No. 17, p. 785*).—This disease which has been known in several provinces of Italy is here shown to occur on the Island of Sardinia. Studies made of the parasites are presented accompanied by illustrations.

Equine piroplasmosis, A. Pricolo (*Mod. Zooiatro, 1907, pp. 14; abs. in Bul. Inst. Pasteur, 6 (1908), No. 17, p. 785*).—A review of the literature on this disease.

Contributions to the study of Filaria irritans, the filaria of summer sores of horses, Fayet and Moreau (*Bul. Soc. Cent. Méd. Vét., 85 (1908), No. 18, pp. 462, 463*).—The authors have made biological studies of this nematode. Adults were recognized for the first time but sexes were not distinguished. The leucocytes of the affected horses were also studied.

A case of Sarcosporidia in the horse, Moussu and Coquot (*Bul. Soc. Cent Méd. Vét., 85 (1908), No. 18, pp. 445–456, figs. 3*).—An extensive report is given of a case of this affection including an account of a post-mortem examination.

A case of tuberculosis in a horse, J. Anderson (*Vet. Rec., 21 (1908), No. 1055, pp. 183, 184*).—The history, symptoms, and result of a post-mortem examination of a case of generalized tuberculosis is reported. The application of

tuberculin gave a positive reaction. The author considers the cervical vertebra to be a very common seat of tuberculosis in the horse.

Tuberculosis affecting the dorsal vertebra of a mare, W. Brown (*Vet. Rec., 21 (1908), No. 1052, pp. 145, 146, figs. 2*).—A case of this affection is reported accompanied by photographs.

Control of hog cholera by serum immunization, A. D. Melvin (*Amer. Vet. Rev., 34 (1908), No. 1, pp. 14–21*).—In this article, which was presented before the annual meeting of the American Veterinary Medical Association, an account is given of the methods of immunization that have been worked out by the biochemic division of the Bureau of Animal Industry of this Department and which have been patented in such manner as to insure to the people of the United States the right to a free use.

Up to the present time the filterable virus causing hog cholera has not been artificially cultivated. A protective serum is produced by hyperimmunization. With a standard serum of known potency susceptible pigs may be protected in two ways, by the so-called serum-simultaneous method and by the serum-alone method. The former, to be used in droves that have not been exposed to hog cholera, consists of injecting subcutaneously on one side of the body of the pig to be vaccinated a suitable quantity of serum and simultaneously on the other side of the body a small quantity of virulent blood taken from a hog sick with hog cholera. Experiments have shown that pigs are thereby given a firm immunity lasting at least 6 months and probably much longer. The serum-alone method which consists simply in injecting the protective serum appears to confer only a temporary immunity upon the treated pigs. This latter method is adapted to the treatment of hogs in a herd in which cholera has already broken out but which have not themselves shown visible symptoms of the disease. It is estimated that the cost of the serum per dose can be brought to 25 cts., as there seems to be no objection to the use for food purposes of the carcass of a hyperimmunized immune.

Experiments have been carried out upon farms under practical conditions. Some 2,000 hogs on 50 farms were thus treated during the fall of 1907 and the results show the efficiency of the method. The practical use is considered entirely feasible. Plans for the eradication of hog cholera by serum immunization are submitted.

Inoculation against hog cholera, J. W. Connaway (*Breeder's Gaz., 53 (1908), No. 20, pp. 1105–1107, figs. 7*).—Experiments conducted by the author in which virulent hog-cholera blood and hyperimmune serum were injected simultaneously are here reported. Out of 56 head that appeared healthy at the time of inoculation only 3 died. All of these are said to have been exposed as much as would ordinarily occur on the average stock farm. The injection of serum into sick hogs did not appear to modify the course of the disease.

Studies on hog cholera and preventive treatment, W. E. King (*Kansas Sta. Bul. 157, pp. 37–90, pls. 8, dgms. 34*).—The investigations here reported were conducted in cooperation with Dr. C. T. McClintock, following unsuccessful attempts to attenuate virulent hog-cholera blood by various physical and chemical means.

Negative results were obtained from attempts made to cultivate the filterable virus of hog cholera artificially in normal hog-serum broth in the abdominal cavity of the rabbit in collodium sacs.

As a large quantity of immune serum is required in the ordinary preventive treatment and since relatively small amounts are secured from individual hogs, experiments were made with other animals in view of producing a serum

at a moderate expense. As a result of experiments with sheep it was concluded that under some conditions the virus was attenuated in such a way as to successfully vaccinate healthy hogs, but these experiments were suspended since it was found impossible to obtain a definite degree of uniformity or standardization of the sheep-serum vaccine. Experiments with the donkey, in which more encouraging results were obtained, were followed by the use of the horse as a medium.

This work was directed particularly toward the production of a horse-serum hog-cholera vaccine and not toward the production of a hog-cholera antitoxin from the horse. The results obtained have been summarized by the author as follows:

"Virulent hog-cholera serum exerts a toxic influence upon a healthy horse when injected intravenously. Normal hog-cholera serum or virulent hog-cholera serum does not appear to produce an anaphylactic reaction when injected intravenously into the horse. The 2-hour horse serum (drawn from the horse 2 hours after the animal has received, intravenously, approximately 150 cc. of hog-cholera virus) when injected subcutaneously into the healthy hog in small quantities produces an acute form of the disease. The 4-hour horse serum when injected into healthy hogs intravenously produces acute hog cholera. The 4-hour horse serum, under certain conditions at least, when injected subcutaneously in small doses into healthy swine does not produce infection. The 5 to 7 hour horse serum when injected subcutaneously into the healthy hog does not produce the disease. The 24-hour horse serum in comparison with 4-hour horse serum, shows attenuated properties. The 24-hour horse-serum vaccine injected subcutaneously and intravenously, and 4-hour horse-serum vaccine when injected in small quantities subcutaneously, act as preventives against hog cholera. The 24-hour horse serum, however, is not constant in respect to its protective properties. A rough estimate shows that horse-serum vaccine can be prepared at a relatively low cost.

"Virulent hog-cholera serum in the liquid form becomes attenuated after a period of 9 months when kept at a temperature of approximately 10 to 15° C. Virulent hog-cholera serum dried under aseptic conditions at a temperature of 37° becomes attenuated after a period of 8 months. Horse-serum vaccine retains its protective properties for at least a period of 6 weeks when kept at an approximate temperature of 10 to 15°."

It is stated that experiments have shown that a hog once immunized to the disease will retain the protection for a period of from 3 to 8 months, or long enough to fatten and prepare the animal for market.

Tests of Bruschettini's hog-cholera vaccine and Bruschettini's hog cholera and swine plague serum, James Wilson (*U. S. Dept Agr., Office Sec. Circ. 27, pp. 2*).—In conformity with provisions made by Congress for the testing of samples of tuberculin, serums, antitoxin, and analogous products bought in the open market, tests were made of Bruschettini's hog-cholera vaccine and Bruschettini's hog cholera and swine plague serum. The results obtained indicate that neither are reliable agents for protecting hogs from hog cholera.

The dog in health, accident, and disease, F. T. Barton (*Philadelphia, [1908], pp. 197, pls. 12*).—A popular work largely devoted to a discussion of the characteristics of the various breeds of dogs, but also briefly considering the accidents and diseases to which dogs are subject.

Experimental studies of acute ankylostomiasis in dogs, J. Cuillé (*Rec. Vét. [Toulouse], 33 (1908), No. 10, pp. 613–618, fig. 1*).—Studies were made of

the symptoms and lesions produced by infecting dogs with *Anchylostomum trigonocephalum*. Only small dogs were found to contract the acute form. In these there is an acute enteritis resulting in dysentery. It is accompanied by a marked anemia and soon terminates in death.

New information on Kala-azar; cultures; inoculation of dogs; etiology, C. NICOLLE (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 9, pp. 498, 499*).—The author has experimentally reproduced Kala-azar in the dog. On September 21 and December 9, 1907, a young dog was inoculated in the liver and within the peritoneum with blood from the spleen of a child affected with the disease. On February 27, 1908, the dog was killed while still in a healthy condition. Numerous typical Leishman bodies were found in the spleen and bone marrow, and also, though more rarely, in the liver. These bodies appear to be identical with those found in the child. It is said that of 4 cases of the disease observed in children in Tunis, 2 had been frequently in contact with diseased dogs. The author is led to conclude that Kala-azar is a disease of the dog that is probably transmitted to man by ectoparasites.

Canine origin of Kala-azar, C. NICOLLE and C. COMTE (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 14, pp. 789–791*).—Of 40 dogs examined at the pound in Tunis, one was found with Leishman bodies in its spleen, bone marrow, and liver. The disease is said to be very difficult to diagnose, since the animals only occasionally appear sick and as it is difficult to detect the parasites in the peripheral blood.

A disease of fowls simulating in some respects fowl cholera, W. ROBERTSON (*Agr. Jour. Cape Good Hope, 32 (1908), No. 5, pp. 577–579, figs. 2*).—The author here reports an investigation made on a disease in which all classes of fowls are affected and in which the mortality is very high. It was found to be due to a bacillus different from fowl cholera. The culture and blood from affected animals remained in a virulent condition for a long period of time. The infection is not conveyed by feces direct, and cages, etc., do not seem to spread the disease.

A case of spirillosis of fowls in Bulgaria, G. GAREITSCHNOFF (*Vet. Sbirka, 1907, No. 7; abs. in Bul. Inst. Pasteur, 6 (1908), No. 12, p. 555*).—This is the report of an observation of the disease in Bulgaria.

Spirochetosis of Cypriote fowls, G. A. WILLIAMSON (*Jour. Trop. Med. and Hyg. [London], 11 (1908), No. 12, p. 181*).—The mortality as reported was very high, probably between 80 and 90 per cent in chickens, although less among older fowls. A spirochæte, probably *Spirochæta gallinarum*, was found in large numbers during the height of the disease. Ticks of the species *Argas reflexus* were found, the larvæ on the fowls and the adults in the crevices of the wood of the henhouse. Ducks on the same run with the fowls have been observed with similar symptoms of spirochetosis and the same species of tick was found upon them. It thus appears that *A. reflexus* as well as *A. persicus* transmits spirochetosis and suggests the possibility that *S. gallinarum* and *S. anserinum* are not true species.

Fowl spirochætiasis in Tunis (*Jour. Trop. Med. and Hyg. [London], 11 (1908), No. 15, pp. 239, 240.*)—Ticks of the species *Argas persicus* sent from a small place near Kairwan, Tunis, transmitted spirochetosis to fowls.

Animal parasites and parasitic diseases, B. F. KAUPP (*Chicago, 1908, pp. 207, figs. 73*).—An epitome of animal parasites intended for use by the student and busy practitioner. The subject is treated in four chapters under the headings ectozoa, entozoa, protozoa, and the preparation of specimens.

Endoglobular hematozoa, A. Lutz and C. Meyer (*Rev. Med. São Paulo, 1908, May 15; abs. in Bul. Inst. Pasteur, 6 (1908), No. 17, p. 769*).—The author has observed 3 types of parasites (Proteosoma, Haemoproteus, and Leucocytozoon) in the birds of Brazil. Of the 20 orders of birds recorded from the country representatives of 9 have been found with hematozoan parasites.

Coexistence of a Leptomonas (Herpetomonas) and a trypanosome in a nonpuncturing muscid (Drosophila confusa Staeger), E. Chatton and E. Alilaire (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 20, pp. 1004–1006, fig. 1*).—The authors found 2 Flagellates (a Herpetomonas and a Trypanosoma) occurring in *Drosophila confusa*, a fly very commonly met with in fermentation work at the Pasteur Institute. They consider this to be the first true trypanosome to be reported as occurring in an arthropod that does not suck blood and as an argument against the vertebrate origin and in favor of the arthropod origin of trypanosomes.

The government veterinary surgeon's report on the disease caused by the Strongylus parasite, J. D. Miller (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 9, pp. 373–375*).—A brief account is given of the Strongylus parasite as met with in the colony of Trinidad and Tobago. It is stated that the pure-bred zebu cattle resist the ravages of the parasite best and that sheep succumb more easily than other animals. Directions are given for the treatment necessary to prevent the ravages of the parasite.

Concerning Trypanosoma congolense, A. Laveran (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 9, pp. 452–455*).—Two goats inoculated with *T. congolense* acquired complete immunity. These animals were then inoculated with *T. dimorphon*, one having died and the other being seriously affected at the time of writing. The author concludes that the two trypanosomes are distinct species.

The transportation of live stock, N. S. Mayo (*Amer. Vet. Rev., 34 (1908), No. 1, pp. 30–34*).—An account read before the American Veterinary Medical Association in which directions are given for the treatment of live stock before and during transportation and after arrival at point of destination.

The Seabury cattle spraying machine, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 33 (1908), No. 3, pp. 336–340, fig. 1*).—A description is given of this machine for use in the destruction of ticks, mange, and lice, and it is announced that one has recently been imported into South Africa. Several hand-spraying tests are reported which indicate that in the application of dips power spraying must be greatly superior.

Apparatus of service in experimental pathology, F. P. Gay (*Jour. Med. Research, 19 (1908), No. 1, pp. 73–75, pl. 1*).—An autopsy board for animals and a self-regulating water bath maintaining a constant temperature are described and illustrated.

Some common disinfectants, M. Dorset (*U. S. Dept. Agr., Farmers' Bul. 345, pp. 12*).—This account has been prepared in order to correct much popular misconception in regard to the value and limitations of the various disinfectants sold in this country. Directions are given for the production of gas from formalin, from paraform, and from wood alcohol. The advantages and disadvantages in the use of formaldehyde, carbolic acid, and cresol are summarized for ready reference. Other disinfectants considered are compound solution of cresol, chlorid of lime, and bichlorid of mercury.

Filing system for bulletins, miscellaneous pamphlets, and clippings, M. H. Reynolds (*Amer. Vet. Rev., 33 (1908), No. 6, pp. 692–700*).—An account and key is given of a decimal system for the filing of bulletins and other literature of value to the veterinarian.

RURAL ENGINEERING.

Cost of pumping from wells for the irrigation of rice in Louisiana and Arkansas, W. B. GREGORY (*U. S. Dept. Agr., Office Expt. Stas. Bul. 201, pp. 39, figs. 2*).—In continuation of work previously noted (E. S. R., 19, p. 86), this bulletin gives the results of tests made to determine the relative cost as well as the efficiency of the methods and machinery used for irrigation pumping in Louisiana and Arkansas, with a view to supplying data to enable rice growers to decide whether to purchase water or to install individual plants.

The 18 plants tested are described in detail, with the results of each tabulated and peculiarities in conditions noted. The author notes that in certain plants having submerged centrifugal pumps the efficiency of engines, pumps, and wells could not be segregated because of the lack of a vacuum gauge attached to the suction pipe, and where there was a poor showing made the fault could not be assigned.

As a result of the tests the writer says, "it appears that under ordinary conditions there is a slight financial advantage in securing water from a canal."

Pumping for irrigation, E. RABETÉ (*Jour. Agr. Prat., n. ser., 16 (1908), No. 47, pp. 654–658*).—Two conventions were held recently at Cahors and Villeneuve-sur-Lot, to investigate the economic value and make tests of the various methods of pumping water in large quantities for irrigation. The conclusions from the convention at Cahors are briefly summarized in the article, among them being that machines furnishing the largest output show the least cost of renewal, and that, other conditions being equal, slow-speed motors are the most economical. The results of the Villeneuve convention are given fully.

At Villeneuve there were in all 16 pumping units tested. Of these 12 had motors of the explosive type and were operated in these tests on naphtha of specific gravity 0.7, 3 had electric motors operated by a continuous current of 230 volts, and 1 had a hot-air engine. In tables showing the experimental and calculated results three classes are observed: (1) Pumping units with an hourly output of more than 36 cu. meters of water lifted to a height of 5 meters; (2) between 5 and 36 cu. meters; and (3) less than 5 cu. meters of water. Many combinations of motors and pumps were tested, as, for example, in the first class were found stationary and movable motors with centrifugal pumps and electric motors belt-connected to centrifugal pumps. In the second class there were centrifugal, duplex, and triplex pumps with belt connections and also a diaphragm pump, all of which were operated by explosive motors. In the third class there were electric motors direct-connected and geared to centrifugal pumps, and also a hot-air engine operating a piston pump.

A table gives the results of cost and output by the hour, and by 100 kg. raised 5 meters. The costs in each class per horsepower per hour were approximately 9, 22, and 26 cts., respectively, with naphtha at 30 cts. per gallon and electric current at 5 cts. per kilowatt-hour.

The high economy of units of large output, the advantages of electric motors of small and average output, and the practical merits of hot-air engines are noted as conclusions from the tests.

Irrigation pumping, A. CHATTERTON (*Rpt. Dept. Agr. Madras, 1907–8, pp. 25–31*).—This report contains information on the installation of oil engines in that locality, the experiments made on government plants to determine the duty and a basis for the sale of water, and the governmental assistance rendered to irrigators in installing pumps. In a few cases the water is taken from streams, but mostly from driven wells. There is also a general account of well-boring operations as carried on in this district.

Irrigation in Victoria, H. G. McKINNEY (*Engin. Rec., 59 (1909), No. 3, pp. 62, 63*).—This is a brief historical review of irrigation in the State of Victoria, showing the causes of failure of many of the promoting companies and giving an account of the work of the commission appointed to investigate the subject of irrigation and rural water supply, and of its efforts to extend irrigation works in the State.

Experimental irrigation farm, W. J. ALLEN (*Agr. Gaz. N. S. Wales, 19 (1908), No. 11, pp. 927–937, figs. 17*).—The author describes the Yanco irrigation farm established by the government as the first to make use of the water provided by the Great Northern Murrumbidgee Scheme. The implements and methods used in preparing the land for water are described and illustrated.

An Egyptian steam cultivator (*Sci. Amer., 100 (1909), No. 7, p. 133, figs. 2*).—This machine is constructed with the idea of pulverizing the soil and stirring and aerating it at the same time that it is broken up. It is illustrated in this article and its mode of operation described.

The essential feature is a set of six disks rotating in a vertical plane transverse to the length of the machine, with curved cutting blades attached to the periphery of the disks at right angles to their plane. The disks are supported at the rear of the locomotive on a U-shaped frame, which can be raised or lowered, allowing the depth of cultivation to be varied up to 12 in. Official tests of the cultivator showed a working capacity of 1.58 acres per hour at an average depth of 9 in. in very dry and hard ground. The engine used was of the vertical type, but will be replaced in later models by a 2-cylinder horizontal type to give more room and better access to the engine parts.

New cotton picking machine (*Nat. Cooperator and Farm Jour., 30 (1909), No. 14, p. 9*).—There is described here a new machine which is reported to have been successfully operated under difficult conditions. It consists essentially of a large drum containing a fan operated by a 2½ horsepower gasoline engine. On the outside of the drum are connected 4 pieces of spiral rubber suction hose, tapering from 2¾ in. at the drum end to 1¾ in. at the nozzle. The cotton is drawn into the machine through these tubes and passes into a square exhaust pipe over the top of the machine and down to about 4 ft. from the base of the wagon carrying the machinery.

Destruction of concrete by alkali, W. P. HEADDEN (*Colorado Sta. Bul. 132, pp. 3–8*).—This contains chemical analyses, made by the author, of cement drain tile, which had disintegrated after only 8 or 9 months' use and also of river water which is assumed to be similar in composition to that which acted on the tile, with a discussion of the relative influence of the chemical constituents involved.

"The salient features in the composition of the salts present in the ground waters of this section are the large amount of sulphates and the presence of carbonates."

The action of a mixture of sodium sulphate and carbonate on coarsely ground concrete was also experimented with and found to yield rapidly a white decomposition product rich in carbon dioxid. The final conclusion from the results of the experiments is that "the action of the ground waters seems to have been one of chemical change converting the lime of the cement into a sulphate and carbonate, accompanied by the removal of silicic acid, alumina, and lime and totally destroying the cohesiveness of the concrete."

The construction and filling of silos, W. A. LINKLATER (*Washington Sta. Popular Bul. 10, pp. 8, figs. 11*).—There are described and illustrated silos of the following types: The King, a stave silo bound with iron hoops, a round silo with wooden hoops, and an eight-side silo of concrete. Practical suggestions

are also given regarding the location, size, and filling of silos, and notes on corn binders, racks, and cutters.

Greenhouse and conservatory construction and heating, P. N. Hasluck (*New York and London, 1907, pp. 160, figs. 238*).—This is stated to be a comprehensive digest of information contributed to the *Building World* (London) on methods and details of construction of various greenhouses and conservatories. The subjects treated are principles of greenhouse construction, horticultural glass and glazing, lean-to greenhouses and conservatories, span-roof greenhouses, dome-roof conservatories, conservatory and veranda, window conservatories, and heating greenhouses. The text is fully illustrated.

Ventilation for dwellings, rural schools, and stables, F. H. King (*Madison, Wis., 1908, pp. VI+128*).—In the introductory chapter of this brief treatise, which is intended especially for parents, teachers, and school officers and the owners and caretakers of live stock, the author discusses the requirements of man and of animals and gives specific examples of the evil effects of insufficient ventilation. There are also discussed the amount of air required, chemical changes and loss of sustaining power in respired air, and the influence and removal of moisture, and simple experiments bearing on these points are suggested.

The second chapter, treating of the principles of ventilation, takes up air movement, the motive power used, and the influence of the wind in this respect. Experiments illustrating air movement are suggested, and the relation of air movement to ventilator construction is discussed.

In chapter 3, on ventilating practice, are given designs of systems for dwellings, rural schoolhouses and churches, stables and poultry houses, showing the application of the principles involved.

RURAL ECONOMICS.

Better agriculture and how to get it, J. Hamilton (*Harrisburg, Pa., 1908, pp. 17*).—This is an address given before the meeting of the Pennsylvania State Board of Agriculture at Harrisburg, January 22 and 23, 1908. It presents a comparison of yields of staple agricultural products in this country and abroad and shows that the greater yields in foreign countries are due in part to the better facilities afforded for itinerant instruction in agriculture.

The latent forces of country life (*Jour. Soc. Agr. Brabant et Hainaut, 53 (1908), No. 52, pp. 1147–1149*).—This article is summarized from a recent work by Tibbaut dealing with the problem of the improvement of rural conditions in Belgium.

The natural healthfulness of the country, it is believed, is not a sufficient inducement to keep farm laborers on the land, and the improvement of the economic and social conditions of country life to counteract the so-called attractions of town life is recommended. Among the needs of the rural population at the present time, the lack of credit is believed to be the greatest. If easier facilities for securing credit could be arranged, together with the affording of opportunity to the laborer of becoming a small holder, it is thought the rural population would greatly increase in numbers and vigor of life.

Farmers' cooperative demonstration work in its relation to rural improvement, S. A. Knapp (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 21, pp. 20*).—The author discusses the necessity for improved rural conditions in the South and presents the remedy offered by the farmers' cooperative demonstration work conducted under the direction of the Bureau of Plant Industry of this Department, with some of the results thus far accomplished.

The demonstration work at present consists in practical field instruction to farmers in scientific agriculture by means of field agents, the instruction being confined to a few essential subjects. When the rudiments of good farming are mastered the farmer secures a greater income for his labor, and he is then taught that this greater income should be applied to the reduction of debt, the betterment of the family and the home, and the improvement of rural conditions. It is claimed that where cooperative demonstration farming has been carried on with sufficient intensity to influence public opinion there have resulted increased yields per acre, the purchase of more and better horses or mules, a great increase in the use of better implements, general interest in seed selection and the use of the best seed, home and school improvements, more months of schooling, better highways, increase of a healthy social life in the country, and intense interest in agriculture.

Cooperation true Americanism, W. M. HAYS (*Raleigh, N. C., 1908, pp. 11*).—This is an address by the Assistant Secretary of Agriculture of this Department read before the Southern States Association of the Commissioners of Agriculture and Other Agricultural Workers at Columbia, S. C., in November, 1907.

The author describes the methods and extent of business carried on by various cooperative dairy, fruit, grain, irrigation, drainage, meat, egg, breeding, and credit associations in the United States and foreign countries, points out the advantages of such organizations in encouraging farm life and promoting national welfare, and urges the appointment of a nonpartisan federal cooperative organization commission to supervise, encourage, and assist the formation of cooperative enterprises in the United States.

Agricultural organization, E. SMITHELLS (*Agr. Students' Gaz., n. ser., 14 (1908), No. 2, pp. 47–51*).—Notes are given on the general principles which govern in cooperation, and improvement in the agricultural industry in England is discussed from the following points of view: (1) That the cost of production must be reduced; (2) that the returns for produce sold must be increased; and (3) that the general conditions under which farming is carried on must be improved. Cooperation among farmers is believed to be the only means to the attainment of these ends.

Producers' associations and cooperative selling and credit societies in France to January 1, 1908 (*Bul. Off. Travail [France], 15 (1908), Nos. 8, pp. 730–741; 9, pp. 844–852; 10, pp. 978–985; 11, pp. 1109–1113*).—Complete returns for the year 1907 are presented and discussed.

The producers' associations numbered 414, as compared with 362 at the close of 1906; the selling associations numbered, respectively, 2,301 and 2,166 for the same periods; and the cooperative credit societies, including 17 district banks and 2,168 rural banks, numbered 2,185 at the close of 1907, a gain of 530 societies over the preceding year.

A serious menace to agricultural associations, HUBERT-VALLEROUX (*Écon. Franç., 36 (1908), II, No. 48, pp. 787–789*).—The author maintains in this article that the test cases made in the courts of France as to the legal standing and functions of agricultural associations must result in their disorganization unless the government so amends the law as to permit the cooperative purchase of supplies and sale of produce in bulk for the benefit of members.

The legality of the operations of agricultural associations, R. WORMS (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 8, pp. 606–629*).—The author discusses the decisions of the courts of France with reference to agricultural associations, differentiates their functions from those of agricultural cooperative societies, summarizes the main points of the proposal made by the minister of agriculture relative to a law legalizing the operations of "economic agri-

cultural associations" designed to take the place of the present associations, and points out the defects in the proposal should it become law.

The agricultural associations (*Feuille Vin. Gironde, 34 (1909), No. 2, pp. 6, 7*).—A review of the development of these associations in France, together with the text of the proposed law and a discussion of its provisions.

Concerning agricultural credit in Rumania, D. Gociu (*Über den landwirtschaftlichen Kredit in Rumänien. Inaug. Diss., Univ. Erlangen, 1907, pp. IV+96*).—This deals with the history and economic significance of the different institutions concerned with agricultural credit in Rumania. Among the benefits to the rural classes as a result of the organization of cooperative credit have been to reduce the amount of mortgages, to increase farm values and farm rents, and to lower the rates of interest. Before the establishment of mutual credit and other agricultural banks annual interest rates ranged from 60 to 570 per cent, but farmers can now secure loans through their societies at from 4 to 7 per cent per annum.

The improvement of farm labor conditions in North Germany (*Deut. Landw. Presse, 35 (1908), No. 97, pp. 1015, 1016*).—This article contains the conclusions reached by Gerlach in his book entitled Ansiedlung von Landarbeitern in Norddeutschland, these being reprinted because of their important bearing on the farm labor problem in Germany. The results of the inquiry relate particularly to the improvement of the economic and social conditions surrounding the life of the farm laborer and include suggestions relating to the granting of land to farm laborers for the growing of their household supplies, the keeping of cows, pigs, and other live stock, regular hours of labor, better housing conditions, better schools for the children, etc. It is believed that the sense of proprietorship in land and other property on the part of farm laborers will be the strongest factor in retaining the most efficient workers on the land.

What influence has piecework upon the agricultural labor problem and how can its most important features be carried out? L. von der Heyde (*Illus. Landw. Ztg., 28 (1908), Nos. 94, pp. 805–807; 95, pp. 813, 814*).—The author shows from the operation of a large farm that there is little financial advantage to the farmer who hires help whether he pays by the year, day, or piecework, but that the moral effects upon the pieceworker and other laborers favor the last-mentioned method of employment. The modification of the conditions and pay of piecework, according to soil, weather, and other circumstances, is advocated for the mutual advantage of both farmer and laborer.

Farm laborers' wages (*Agr. Gaz. [London], 68 (1908), No. 1825, p. 389*).—The wages of farm laborers in Great Britain are discussed in this article. At present these range from 8s. 9d. (about $2.10) per week in County Mayo, Ireland, to 25s. 5d. (about $6.10) in Lancashire, England.

Cost of producing crops in the Hawkesbury district (*Agr. Gaz. N. S. Wales, 19 (1908), No. 9, pp. 732–734*).—From tests made in Australia, the cost of producing corn was about £4 per acre, the estimated profit being about £2 5s. The corresponding figures for the cost of wheat for hay and for grain were £2 11s. 7d. and £1 14s. 9d., the profits being estimated at about £1 8s. per acre for each crop.

Turkish land tenure (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 11 (1909), No. 2, pp. 15, 16*).—Notes are given on the chief systems of land tenure in Turkey, namely, government ownership, eleemosynary ownership, and freehold. The greater part of the land devoted to agriculture is owned by the State, the peasants working the land on shares called the "tithe," strictly tenderable in produce, although usually paid in money. The pasture land is held in common

for the use of the whole village without limitation as to the number of cattle that may be admitted by any one peasant. Instances of collective farming are also reported. Notes are also given on the methods of transferring land, taxation, and other economic features of the Turkish system.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 11 (1909), No. 2, pp. 9–16*).—Statistics on the number and value of farm animals in the United States, the stocks of potatoes on hand, the imports and exports of animals and animal products in 1907 and 1908, and other data on the condition of crops and live stock in foreign countries are reported, together with an article on the Turkish land tenure system noted above.

AGRICULTURAL EDUCATION.

The educational needs of country life, E. A. Bryan (*Pacific Homestead, 18 (1908), No. 18, p. 29*).—In this article the author advocates instruction in agriculture in the public schools, the consolidation of small schools, and the giving of agricultural instruction through extension work to the adult members of the community.

The work of the agricultural school in the scheme of State education, A. M. Soule (*South. Ed. Rev., 5 (1908), No. 7–8, pp. 176–186*).—A paper advocating the consolidation of rural schools and the establishment of Congressional district agricultural high schools.

Centralized schools in Ohio, A. B. Graham (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1909), No. 6, pp. 24, figs. 41, dgms. 6*).—This summarizes the present situation in Ohio with reference to centralized rural schools. It includes the State law under which consolidation has taken place, many illustrations of the schools and means of transportation to them, and a statement of the demonstrated advantages of the new system over the old.

Teaching agriculture in public schools, W. J. Spillman (*Wallaces' Farmer, 33 (1908), No. 52, p. 1601, fig. 1*).—Suggestions for teaching agriculture in public elementary schools without the use of a text-book.

Agricultural education with special reference to Ireland, J. R. Campbell (*Dept. Agr. and Tech. Instr. Ireland, Jour., 9 (1908), No. 1, pp. 3–18*).—In this address, delivered before the British Association for the Advancement of Science at Dublin, September, 1908, there are discussed (1) the want of harmony in methods of providing for and administering agricultural education in different countries, (2) science as an aid to agriculture, (3) the agricultural work and policy of the Department of Agriculture and Technical Instruction for Ireland, (4) the department and agricultural education, (5) agricultural education for women, (6) agriculture and elementary schools, and (7) agriculture and the universities.

Agricultural education, N. G. Mukerji (*Handbook of Indian Agr. Calcutta, 1907, 2. ed. rev., pp. 696–700*).—A brief statement of the present status and opportunities for development of agricultural education in India.

The College of Hawaii: Its work and outlook, J. W. Gilmore (*Hawaii. Forester and Agr., 6 (1909), No. 1, pp. 2–13*).—Brief reference is made to the agitation for colleges for the industrial classes and the Morrill acts of 1862 and 1890. The organization of the College of Hawaii, and the courses of study are outlined and described.

The State Agricultural Institute, Gembloux, H. Raquet (*Expansion Belge, 1 (1908), No. 11, pp. 469–475, figs. 12*).—A historical account of the organization, work, maintenance, etc., of the State Agricultural Institute at Gembloux.

College course for florists, C. N. Page (*Weekly Florists' Rev., 23 (1908), No. 577, pp. 10, 11*).—This paper, which was read at a meeting of the Society

of Iowa Florists, in Des Moines, December 9, 1908, suggests a college course for florists.

A course in agriculture for the public schools of Michigan, W. H. FRENCH (*Mich. Agr. Col., Dept. Agr. Ed. [Pamphlet], 1908, pp. 36*).—A brief outline for a course in agriculture for the elementary schools of Michigan is given, together with a similar outline for high schools, supplemented by more detailed directions for carrying on botanical work, lessons on farm crops, farm management, farm mechanics, horticulture, animal husbandry, and soils. Lists of books and bulletins suitable for the agricultural library of high schools are suggested.

Agriculture and school gardens, S. C. KELLERER (*Philippine Agr. Rev. [English Ed.], 1 (1908), No. 8, pp. 327–334, pls. 3*).—The writer gives reasons for teaching agriculture and school gardening and specific directions for preparing school gardens.

Suggestions for school gardens, J. R. WILLIAMS (*Jamaica, 1908, pp. 148, dgms. 3*).—This is a manual for teachers, dealing with garden processes rather than the principles of plant production. In the main part of the book the author takes up the selection and preparation of garden plats, the necessary tools, soils, seed beds, seedlings, care of plants, propagation of plants, rotations, and friends and enemies of the garden. This is followed by appendixes dealing with cultural directions for vegetables, cocoa, coffee, ginger, pineapples, tobacco, bananas, oranges, cotton, Guinea corn, sarsaparilla, pindars, vanilla, and flowers, with one chapter on insecticides.

Improvement of school grounds, H. L. HUTT (*Toronto: Ed. Dept. Ontario, 1908, pp. 35, pls. 12, dgms. 12*).—Plans and suggestions for the improvement of rural and urban school grounds.

Home nature-study course, ANNA B. COMSTOCK (*Home Nature-Study Course [Cornell Univ., State Col. Agr.], n. ser., 5 (1908), Nos. 1, pp. 40, figs. 14; 2, pp. 41–64, figs. 12; 3, pp. 65–88, figs. 13*).—Suggestions for the work of fourth and fifth year pupils as outlined in the Syllabus of Nature Study and Agriculture issued by the New York State Department of Education. There are given 3 lessons on the woodchuck, 3 on the brook, 2 on the kingfisher, 4 on the witch-hazel, 3 on the hickory, 7 on spiders and their webs, 2 on the moon, 2 on the crow, 2 on the beech, 4 on star study, 1 on wild carrot, 1 on a wasp nest, 3 on the muskrat, 5 on the honeybee, 1 on the walnut, and 1 on the sun.

Nature's craftsmen, H. C. MCCOOK (*New York and London, 1907, pp. XII+317, pl. 1, figs. 103*).—A collection of nature stories concerning ants, antlions, bees, spiders, birds, wasps, cicadas, water-striders, and caddis worms, with two chapters discussing insects and civilization and beneficial and injurious insects.

[Exercises in nature study] (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1908), Nos. 3, pp. 4–12, figs. 9; 4, pp. 4–14, figs. 14*).—These numbers contain the following articles: The Story of the Life of a Moth, by F. M. Webster; What Makes the Wind Blow, by J. W. Smith; and A Little Lesson in Studying Sheep, by C. S. Plumb.

Propagation of plants, V. H. DAVIS (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1909), No. 5, pp. 16, figs. 11*).—A study of the propagation of plants by (1) seeds or spores and (2) the vegetative method or division of the plant.

Tillage and cultivation, A. G. MCCALL (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1909), No. 7, pp. 4–11, figs. 7*).—This describes and illustrates the proper cultivation of the soil for water storage, aeration, and conservation of moisture, and suggests simple experiments for use in rural schools.

A corn primer, C. S. KNIGHT (*Agr. Ed. [Kans. Agr. Col.], Teachers' and Pupils' Ser., 1 (1908), No. 1, pp. 46, figs. 15*).—A guide for teachers in helping their students to become more familiar with the characteristics of corn. It

deals with the botany of the plant, its types or general classes, the types most commonly grown in this country and important varieties grown in Kansas, studies of the plant and the ear, and of the different parts of the kernel, and their mechanical separation, corn as food, commercial products of corn, its importance as a crop, its improvement by means of fertilizers, culture, and breeding, corn judging, and suggestions for corn experiments.

MISCELLANEOUS.

Twenty-first Annual Report of Illinois Station, 1908 (*Illinois Sta. Rpt. 1908, pp. 11*).—This contains lists of the publications of the station issued since its establishment and during the fiscal year, a brief statement concerning the principal lines of station work, and a financial statement for the fiscal year ended June 30, 1908.

Nineteenth Annual Report of Mississippi Station, 1906 (*Mississippi Sta. Rpt. 1906, pp. 12*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1906, and a report of the director on the work of the station during the year.

Twentieth Annual Report of Mississippi Station, 1907 (*Mississippi Sta. Rpt. 1907, pp. 12*).—Data corresponding to the above are presented for the fiscal year ended June 30, 1907.

Twenty-first Annual Report of Mississippi Station, 1908 (*Mississippi Sta. Rpt. 1908, pp. 1½*).—Data corresponding to the above are presented for the fiscal year ended June 30, 1908.

Twenty-seventh Annual Report of Ohio Station, 1908 (*Ohio Sta. Rpt. 1908, pp. XXIX, pl. 1*).—This contains an announcement concerning the work of the station, the organization list, a report of the board of control, a financial statement for the fiscal year ended June 30, 1908, and a report of the director summarizing the work of the station during the year.

Report of the Imperial Department of Agriculture for the years 1905–6 and 1906–7 (*Rpt. Imp. Dept. Agr. [India], 1905–1907, pp. IV+76*).—This includes the reports of the inspector-general of agriculture in India, the officiating director of the agricultural research institute, and the various heads of departments. An appendix contains a list of agricultural publications in India during 1905–6 and 1906–7.

Report of the work of the agricultural experiment station of the University of Jena for 1907 (*Ber. Landw. Vers. Stat. Univ. Jena, 1907, pp. 32*).—A summary of the work of this station for 1907 in fertilizer, feeding stuffs, and dairy products control, seed inspection, plant diseases, variety testing, fertilizer trials, veterinary science, and other lines.

Memorial of the celebration of the fiftieth anniversary of the agricultural experiment station at Pommritz (*Denkschrift zur Feier des 50 jährigen Bestehens der Agrikulturchemischen Versuchsstation für die Königl. Sächs. Oberlausitz zu Pommritz. Pommritz, [1907], pp. 69, figs. 3*).—This contains an account of the history and work of the station, the period from its establishment in 1856–1881 being discussed by E. Heiden, and the subsequent history to 1907 by G. Loges.

Note on agriculture in Japan, F. A. Nicholson (*Madras: Govt., 1907, pp. VII+122, pls. 2, fig. 1*).—Observations on agricultural practice in various parts of the southern districts of Japan, as based on a visit in 1906, are presented. The general conditions and characteristics of Japanese agriculture, the use of manures, and the forest conditions are set forth, with an account of new methods being introduced through education, the establishment of experiment

stations, agricultural associations including agricultural banks and cooperative associations, and the supervision of fertilizers.

Encyclopedia of agriculture, edited by C. E. GREEN and D. YOUNG (*Edinburgh and London, 1908, vol. 3, pp. VIII+633, pls. 17, figs. 157, map 1*).—This is the final volume of the general encyclopedia of agriculture and contains articles on topics arranged alphabetically from Kainit to Zelkova.

The British yearbook of agriculture and agricultural who's who, 1908–9 (*London, 1908, pp. VI+582*).—A handbook of information relative to British agriculture, the data being grouped under 10 heads, as follows: Societies and institutions of a national and general nature; county and local societies and institutions; agricultural, horticultural, and veterinary education and research; diseases of animals, including the regulations of the Board of Agriculture and Fisheries relating thereto; British foreign and colonial regulations relative to the importation and exportation of animals; lists of British agricultural publications, including official documents, books issued during 1907, publications of societies, agricultural colleges, county councils and similar bodies, and periodicals, as well as of official publications of the British colonies, India, and this country; markets, sales, and prices of agricultural products; statistical, legal, and general information, including data on small holdings, a list of shows in 1908; and an agricultural "who's who," which gives data regarding about 2,000 teachers, writers, and other persons prominently connected with agriculture in Great Britain.

American Agriculturist handbook for 1909 (*New York, Chicago, and Springfield, Mass., 1909, pp. 192, figs. 90*).—This is stated to be "a ready reference book for farm, home, and office." It contains statistical data with reference to crop yields and animal production for 1908; accounts of the work of the Forest Service and the Weather Bureau of this Department, and of the conservation movement; a glossary of terms used in agricultural science; brief discussions of various agricultural operations, including a spraying calendar, planting tables and feeding stuffs tables; and a directory of officers in charge of National and State agricultural work and of a large number of agricultural organizations, together with a variety of miscellaneous data.

The commercial products of India, G. WATT (*London, 1908, pp. VIII+1189*).—This is an abridgment of The Dictionary of the Economic Products of India, and constitutes an encyclopedia of Indian animal, vegetable, and mineral products of present or prospective commercial and industrial importance.

Press bulletins (*Ohio Sta. Bul. 196, pp. 283–285*).—Reprints of press bulletins on the following subjects: Yellow leaf in oats; late blight and rot fungus of potatoes now prevalent; the failure of the clover crop; seed corn for the season of 1908; how to fight the rose chafer; and the grape berry worm.

Experiment Station Work, XLIX (*U. S. Dept. Agr., Farmers' Bul. 342, pp. 32, figs. 3*).—This number contains articles on the following subjects: Conservation of soil resources, potato breeding, disk-harrowing alfalfa, the Montreal muskmelon, storage of Hubbard squash, fig culture in the South, mushroom growing, preserving wild mushrooms, cooking beans and other vegetables, and a model kitchen.

NOTES.

Colorado College and Station.—According to a note in *Minnesota Farm Review*, Fritz Knorr, assistant agronomist, has resigned to engage in commercial work.

Delaware College and Station.—The legislature has appropriated $10,000 for new buildings on the college and station farm and a like amount for repairs and maintenance of the college buildings.

Florida University and Station.—Dr. Andrew Sledd, president of the university for 4 years, has resigned to take effect July 1, and Dr. A. A. Murphree, president of the Florida Female College, has been chosen his successor. Thomas Hamilton, assistant plant pathologist, has resigned.

Hawaiian Sugar Planters' Station.—C. F. Eckart has returned from his leave of absence and resumed charge of the division of agriculture and chemistry.

Idaho University and Station.—H. T. French has resigned as director to take effect June 1. The establishment of three substations has been recently authorized, one of them to be located in either Bonner or Kootenai counties for work in connection with stump lands and swamp lands, another in Lincoln County for work with irrigation problems, and the third in Bingham County for work in dry farming.

In the university departments of veterinary science and forestry have been added, the latter to offer a regular 4-year course and a short winter course for forest rangers.

Purdue University and Station.—In addition to the increased appropriations to the station for maintenance, previously noted, the college of agriculture was granted $30,000 for a live stock judging pavilion and $20,000 for a farm mechanics building. A slight reduction was made as to the fees to be collected in the feeding stuffs inspection work of the station.

Iowa College and Station.—John Bower, assistant professor of dairying in the college and assistant dairyman in the station, and H. C. Horneman, in charge of the extension work in dairying, have resigned to engage in commercial work. E. T. Robbins has been succeeded as assistant in animal husbandry in the station by H. H. Kildee.

Kansas College and Station.—Appropriations aggregating $671,500 were granted by the last legislature for the ensuing biennium, together with $12,666.67 additional to restore endowment. Among the items authorized are $375,000 for current expenses, $35,000 for the purchase of land, $100,000 for an armory, gymnasium, and equipment, $5,000 for an athletic field, $10,000 for a greenhouse, $30,000 for the station, $52,500 for farmers' institutes, $25,000 for engineering equipment, $10,000 for a dairy herd and building, and $29,000 for heat and power equipment, repairs, and improvements to the grounds.

Kentucky Station.—W. H. Scherffius, head of the agricultural division, has resigned to take up work in South Africa, and L. A. Brown, of the North Dakota Station, has been added to the staff as chemist in the drug division.

Minnesota University.—*Science* announces a gift to the university by the Weyerhauser interests of St. Paul of 2,200 acres of land in Carlton County for experimental work in forestry.

Cornell University.—The exercises of Farmers' Week, held February 22–27, were very largely attended, the registration reaching 1,275. The programme included a general reunion of agricultural students resulting in the formation of a permanent association, meetings of the State Experimenters' League, Plant Breeders' Association, Poultry Association, the Cornell Horticultural Union, the Dairy Students' Association, the newly formed State Drainage Association, and other organizations, together with a corn congress, horse show, poultry institute, housekeepers' conference, the second annual agricultural stage, and a large number of lectures and demonstrations.

The total enrollment in the college of agriculture is 813, of whom 364 are in the three-months' winter course. The instruction in economic entomology, formerly given by the late Professor Slingerland, has been temporarily discontinued. A bequest made to the university by the late Dr. Charles A. Ring, of Niagara County, the interest of which is to be used in the advancement of horticultural science, is announced. The recent death is noted of Dr. C. H. Roberts, the donor of the 5 scholarships for aiding needy students in the college of agriculture.

A. R. Mann, formerly assistant professor in dairy industry, has been appointed secretary to the dean. Allan Ferguson, assistant in cheese making, has resigned to engage in commercial work.

North Carolina State Station.—I. O. Schaub, assistant in soils at the Iowa Station, has been appointed to carry on similar work at this station and has entered upon his duties.

Ohio University and Station.—The department of horticulture and forestry in the university has been divided, W. R. Lazenby retaining charge of the work in forestry. The first State poultry institute was held at the university March 9 and 10.

In the station, recent appointments include J. J. Crumley, Ph. D. (Johns Hopkins), of Antioch College, assistant forester; John S. Houser, whose resignation from the Cuban Experiment Station is noted elsewhere in this issue, and Leonard L. Scott, assistant entomologists; and W. A. Lloyd, assistant experimentalist.

Oregon College and Station.—The third demonstration train to be sent out was recently operated in southern Oregon, and in general interest and attendance was remarkably successful. Fully 30,000 people visited the train during the 4 days it was in operation, this representing two-thirds of the total population of the district traversed.

The special features emphasized were horticulture and poultry husbandry. The two horticultural cars were filled with educational material, including modern spraying devices, orchard tools and implements, specimens of correct and incorrect methods of grafting, pruning, budding, etc., frost-fighting apparatus, models of greenhouses and cold frames, seed-testing equipment, a large collection of the various types of soils, fertilizers, cover crops, and charts of special value to the orchardist and gardener.

In the poultry exhibit a flat car was inclosed with a portable poultry fence within which was a modern colony house and a flock of 20 Barred Plymouth Rocks. A baggage car contained further exhibits of 12 breeds of poultry, both live and dressed, various types of brooder houses in operation, incubators, trap nests, bone mills, spray devices, egg packers and other appliances, and numerous charts containing data as to the value of different rations for egg production, systems of housing, and other topics of interest.

Utah College and Station.—Appropriations to the college and station aggregating $202,100 have been made by the legislature. This is nearly double the

total amount granted 2 years ago, and represents the full amount requested. The college received $132,000 for maintenance, $20,000 for remodeling the women's building, $3,500 for a veterinary hospital, $2,500 for a stock-judging pavilion, and $600 for an incubator cellar. The grant for farmers' institutes was increased from $3,000 to $10,000. The station was given $5,000 for publications, $10,000 for dry-farming investigations, $11,000 for fruit investigations, and $7,500 for irrigation and drainage investigations. The various members of the board of trustees were reappointed, with the exception of A. S. Condon, who has been succeeded by Mathoniah Thomas of Salt Lake City. Under a new law the board is to be increased to 9 members, but the additional appointees have not as yet been announced.

Vermont University and Station.—*Science* announces that William Stuart, professor of horticulture and horticulturist, has accepted an appointment with the Bureau of Plant Industry of this Department, and will enter upon his duties at the close of the college year.

Wisconsin University and Station.—An experimental forestry laboratory is to be established at the university by the Forest Service of this Department. A building to cost $30,000 is to be erected for the purpose at an early date by the university, on a site adjacent to the college of agriculture. The Forest Service is to supply equipment and maintain a corps of investigators. It is expected that the laboratory will be available to the faculty and students of the university for research work, and that members of the staff will deliver lectures on forestry and related topics in the university courses as well as in a course for forest rangers to be established by the university. Among the lines of experimental work to be taken up in the laboratory are tests of various woods for paper pulp and for building materials, and the distillation of turpentine, alcohol, and resin from wood waste.

The new animal husbandry building and judging pavilion has been completed at a cost of about $75,000. The building is built of reinforced concrete and brick, with tile roofing, and contains offices for the departments of horse breeding and animal husbandry and the farm superintendent, veterinary demonstration and operating rooms, stables for breeding stock and sale animals, an isolation hospital, and an arena 165 by 65 ft., with a capacity of over 2,000.

County branches of the State Experiment Association are being organized with a view to closer supervision of experiments and greater specialization in planning tests to meet local conditons.

Wyoming University and Station.—The legislature has continued the biennial appropriation for farmers' institutes of $2,000 and has appropriated $15,000 to complete the wing of the residence hall for women, and $8,000 for the construction of barns on the station farms. V. J. Tidball, of Laramie, has been appointed on the board of trustees and the station committee, vice H. L. Stevens.

Cuban Experiment Station.—Following the change in administration, the resignations of the following members of the staff were called for: Dr. N. S. Mayo, chief, and J. S. Montgomery, assistant, department of animal industry; William T. Horne, chief, and J. S. Houser, assistant, department of vegetable pathology and entomology; R. S. Stark, chief, department of chemistry; Dr. H. Hasselbring, chief of the department of botany; and C. F. Austin, chief; C. F. Kinman, assistant, department of horticulture; Ricardo Villaescusa, assistant, department of agronomy; and Richard Hargrave, secretary. W. T. Horne was reappointed, and the department of botany was placed in his general charge.

County Demonstration Farms.—A bill has been passed by the Oklahoma legislature providing for the establishment of a demonstration farm of 40 acres in each county, under the general management of the State Board of Agriculture,

with the local supervision of the county farmers' institutes. An annual appropriation of $40,000 is provided for this work.

A similar law has been enacted by the Kansas legislature. Under this measure, however, the county commissioners are to make application to the board of regents of the Kansas College, and upon their approval the farms may be established and conducted under their supervision. The county is to provide the land necessary, which is not to exceed 40 acres. The cost of maintenance is limited to $1,500 for the first year and $500 thereafter, together with the receipts from farm products. A brief summary of each year's operations is to be distributed to each taxpayer of the county.

Under the Missouri law of 1907, the first county demonstration farm in that State is to be established in Jasper County in the near future under the joint supervision of the county court and the Missouri Station. The county contributes $500 annually for 5 years and the State assumes the remaining expense.

A New Government Dairy Farm in South Australia.—The South Australian government has purchased 1,600 acres at Turretfield, chiefly for the purpose of encouraging the keeping of improved breeds of milch cows and of demonstrating the best methods in up-to-date dairy practice. P. H. Suter, the government dairy expert, will make the farm his headquarters and will give a special course in dairying to a few students.

New Buildings of West Java Sugar Station.—An elaborate set of buildings for the sugar experiment station at Pekalongan, West Java, has recently been completed. The buildings include several laboratories and offices, a library, and a large museum.

First International Domestic Science Congress.—An account of this congress, which was held at Freiburg, Switzerland, September 29 to October 1, 1908, is given in a recent number of *Mittcilungen der Fachberichterstatter des K. K. Ackerbauministeriums*. The attendance reached nearly 700, and while the majority of those present were interested in the organization and development of domestic science instruction in city schools, agricultural instruction in the rural domestic science schools was not overlooked, and at the second session it was resolved that domestic science instruction in rural schools should be given an agricultural trend. Brief notes are also given in the number concerning agricultural domestic science instruction in Hungary, Germany, Switzerland, France, England, Sweden, Norway, and Belgium.

The Automobile in Agriculture.—A recent number of *L'Automobile Agricole*, a journal established two years ago to promote the use of mechanical motors in agriculture, announces that steps have been taken to organize an international congress of the agricultural automobile and the application of mechanical motors in agriculture.

Prospective Agricultural and Educational Meetings.—Meetings of the following organizations are announced: Association of American Agricultural Colleges and Experiment Stations at Portland, Oreg., August 18–20; American Association of Farmers' Institute Workers, at Portland, August 16 and 17; National Education Association, at Denver, Colo., July 5–9; Association of State and National Dairy and Food Departments, at Denver, August 9; and National Irrigation Congress, at Spokane, Wash., August 9–14. The National Corn Association is to hold its third show at Omaha, Nebr., December 6–18.

University of Virginia Summer School.—The University of Virginia offers a summer term from June 18 to July 31, the courses including educational psychology, rural school problems, history of education, agriculture, domestic economy, manual training, nature study, school gardening, teachers' training

work, and several other lines of study. A detailed description of all the courses appears in the April number of the *University of Virginia Record.*

Hampton Summer Session.—The Hampton Normal and Agricultural Institute, Hampton, Va., announces a four weeks' summer session for teachers, June 15 to July 13, with courses in cooking, dressmaking, manual training, nature study, poultry keeping, principles of teaching, and other academic subjects.

Louis Queiros School of Agriculture.—A letter received from the director of this institution, Mr. C. D. Smith, formerly director of the Michigan Station, gives numerous details regarding the school, which is located at Piracicaba, State of São Paulo, Brazil.

A definite organization has recently been effected, under which authority is concentrated almost entirely in the director, with the general supervision of the secretary of agriculture. The regular course of study is modeled in a general way after that at the Michigan College. It covers 3 years, with a preparatory year of arithmetic, Portuguese, French, geography, and history, and a subsequent year of special elective work in any of the sciences or in practical agriculture. The three-year course includes 3 semesters each of botany, chemistry and biology, and 1 semester each of stock judging, soils and plantations, harvests and seed selection, veterinary clinics, and carpenter and blacksmith work.

The equipment includes a farm of 800 acres of excellent land, large barns, and botanical, chemical, physical, and zoological laboratories. The faculty numbers about 10 at present, among them being J. W. Hart, formerly of the University of Illinois. The number of students is rapidly increasing and is expected shortly to reach the limit that can be accommodated under present conditions. For the maintenance of the school $274,000 is available for the present year in addition to the receipts from farm products, which amount to about $15,000.

Agricultural Instruction in Trinidad.—A recent number of *The Agricultural News* states that a course of lectures in agriculture is being given at the Port-of-Spain Training School and the San Fernando Training School. The course consists of thirty-six lectures, each of one hour's duration. One lecture is given weekly at each school, and an examination is held at the end of each twelve lectures.

Nature Study.—The *Nature-Study Review* began in May, 1908, a series of numbers, each of which is devoted to the nature-study work done in a particular State. The May number deals with California, the October number with New Jersey, the December number with Illinois, and the number for February, 1909, with Indiana. The California number presents the Place of Nature Study in the Normal School, Nature Study in the San Diego and Chico Normal Schools, the Present Needs and the Outlook for Nature Study in California, and a summary by H. W. Fairbanks. The New Jersey number contains a survey of nature study in the State, elementary science in the schools of Newark, nature study at home, practical experiments in the school room, a wild flower garden, school garden lessons at Montclair, and several other interesting articles, including A Demand for a Philosophy of Nature Study by C. H. Robison. The Illinois number includes articles on nature and other subjects of instruction, recent aspects of the nature-study movement, the nature-study situation in Illinois, school-room study of a robin's nest, and a review of the work of the John Swaney Consolidated School. The Indiana number includes articles on nature study in Indiana, the character, purpose, and extent of elementary agriculture in Indiana, nature-study work in Elkhart and East Chicago, school gardens at Delphi, corn contests in Hendricks County, and nature study in a museum by the director of the Fairbanks Museum, St. Johnsbury, Vt.

The January number is devoted largely to various phases of school industrial work. The topics are introduced with a note by O. W. Caldwell, of the University of Chicago, who argues for the inclusion of elementary industrial work in the regular school courses rather than the establishment of distinctive separate courses, because (1) efficiency in any line of industrial work requires a good general foundation in many subjects of study; and (2) general industrial education is needed to develop an understanding of the conditions of workers in other lines. "Industrial education should exist to make more efficient men and women. . . . We are in great danger of concluding that industrial education is for the work rather than for the worker." The value of poultry raising as a school occupation is illustrated by W. A. Baldwin, principal of the State Normal School, Hyannis, Mass., and C. H. Robison, of the State Normal School, Montclair, N. J., suggests "urbindustrial" and "agrindustrial" or "rurindustrial" as convenient terms for distinguishing the kind of industrial education proper to city and rural conditions.

Agricultural Legislation in Congress.—The principal agricultural legislation enacted at the final session of the Sixtieth Congress was embodied in the act making appropriations for this department, which is summarized elsewhere in this issue. In the diplomatic and consular appropriation act an appropriation of $4,800 was continued for the payment of the annual quota of the United States for the support of the International Institute of Agriculture. By a clause in the Indian appropriation act, the property of the Indian School at Morris, Minn., comprising 290 acres of land with buildings and equipment, was transferred to the State of Minnesota upon the condition that it be accepted by the State prior to July 1, 1910, for maintenance as an agricultural school to which Indian pupils are to be admitted without tuition and upon terms of equality with white pupils. By another act the University of Idaho was empowered to purchase 640 acres of land in the Coeur d'Alene Indian Reservation for use as a biological station, an encampment ground, and a forestry station. A joint resolution was passed authorizing the President of the United States to extend an invitation to the International Congress of Applied Chemistry to hold its eighth meeting in this country in 1912.

New Journals.—Société d'Études d'Agriculture Tropicale has established as its monthly organ *L'Agronomie Tropicale*. The initial number contains articles dealing with the cotton situation, stock raising in the Congo, the witch's broom disease of cacao, a list of German organizations engaged in the exploitation and culture of rubber, and abstracts of publications dealing with tropical agriculture and animal husbandry.

La Terre Vaudoise is being issued as a semimonthly by the Vaudoise Society of Agriculture and Viticulture, replacing *Chronique Agricole du Canton de Vaud* and *Bulletin de la Société Vaudoise d'Agriculture et de Viticulture*.

Wasser und Abwasser is a semimonthly journal devoted chiefly to abstracts of publications dealing with water supplies and the disposal of sewage and factory wastes. An original article also appears in each number.

Pomona Journal of Entomology is being published as a quarterly by the department of biology of Pomona College. The initial number contains articles on Aphididæ of Southern California and Notes on Coccidæ, by E. O. Essig; The Red Scale, by A. J. Cook; and Western Plant Louse Parasites, by C. F. Baker.

Fortschritte der Chemie, Physik und physikalischen Chemie is being published monthly as a new edition of *Physikalisch-chemischen Centralblattes*. Dr. Hermann Grossmann, of Berlin, is editor, and the staff includes Dr. H. Kappen, of Jena, in charge of agricultural chemistry; Dr. F. Ehrlich, of Berlin, in charge of the chemistry of the agricultural industries; and Dr. Hübner, of Berlin, in

charge of food chemistry. The initial number deals largely with physical chemistry, photochemistry, and electrochemistry.

The American Farm Review and Digest of the Agricultural Press is being issued monthly. As announced in the initial number, it is to contain original articles but its main purpose is to furnish a digest of articles appearing in the agricultural press of this country, with comment thereon by the various department editors. Among these are Bristow Adams, of the Forest Service of this department, in charge of forestry; J. C. Kendall, of the Kansas College and Station, in charge of crops in the West; Thomas Shaw, formerly of the Minnesota University Station, in charge of crops in the North; H. F. Hall, formerly of the New Hampshire College and Station, in charge of horticulture; and Frank Benton, formerly of the Bureau of Entomology of this department, in charge of bee keeping.

Horn and Hoof is being published monthly in the interest of dairy and stock farmers of the Northwest. The initial numbers contain numerous articles by experts from the agricultural colleges and this department.

The Illustrated Poultry Record is being published in London as a monthly. One of its sections is designated to education and experiments in which considerable attention is given in the opening numbers to work under way in North America. J. E. Rice, of Cornell University, is special correspondent from this country.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

CONTENTS OF VOL. XX, NO. 10.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Continued.

U. S. Department of Agriculture.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

Vol. XX. May, 1909. No. 10.

The extension of agricultural education work to its full development must depend largely on its capability of being coordinated with the general educational agencies already in operation. The number of such agencies is great, but they have not yet been brought into that harmony of purpose and action which can secure the largest educational results, and therefore none of them is now used to the best advantage. Consequently, any plan which has for its object the fuller realization of educational possibilities through the utilization and development of agricultural studies as an integral part of the general educational scheme deserves more than passing attention.

The University of Tennessee has recently inaugurated a unique plan of agricultural extension work in certain high schools of that State. The plan is designed to illustrate in its practical results the cultural value of instruction in agriculture to the general student in secondary schools, as well as its usefulness to those who may sometime follow the business of farming.

Briefly described, this plan provides for the monthly visitation of a limited number of high schools by the head of the university department of agricultural education, assistant professor Josiah Main, who gives at each visit a lesson and a demonstration, accompanied by an outline of work to be done the next month with suggested readings and reviews. He is also regarded as available for any popular lectures on education that may be arranged for in connection with these monthly visits. The university bears all the expenses of this visitation and supervision of the schools—unless the local community desires to provide entertainment for the visitor—but requires each school to assume responsibility for the success of the work by giving it a regular place in the school programme, providing a regular teacher for the class between visits, continuing the work from year to year so long as the university offers cooperation, and ultimately maintaining the work independently of the university connection as soon as financial support and other conditions justify. The expense for material equipment for the work will run from a minimum of $10 to whatever the school is willing to provide annually.

At present eleven county high schools in the State are taking advantage of this cooperative plan. Each lesson given by the visitor presupposes the mastery of all former lessons, thus making the work cumulative and capable of increasing technicality. The present series will be collected into a printed and illustrated form which can be taught to succeeding beginners' classes in each school without the necessity of much supervision. In this way the list of schools and trained teachers is developed together, and schools that drop out of the list are succeeded by new ones from the waiting list.

Several important advantages at once suggest themselves in this plan, considered as a whole, and the legislature has indicated its approval of the experiment by passing an act granting financial aid to high schools introducing agriculture, domestic science, and mechanic arts. Such a plan makes effective use of existing secondary schools. It takes these schools and teachers as they are, and develops the new work without displacing their present mechanisms or personnel. It gives opportunity for the demonstration of valuable results before calling for anything but nominal local expenditures in support of the work installed. In short, it seems perfectly adapted to existing conditions while affording the means of constantly surpassing them through the new impulse which must come with the wise introduction of agricultural instruction as a subject of general cultural value in secondary schools.

We know of no other State institution that has undertaken such a plan, and the experiment will be watched with much interest. The view-point which regards agriculture as a legitimate and valuable addition to cultural school subjects, in addition to its value for practical application in later life, seems to be gaining increasing adherence. It rests upon a much more secure foundation than do the arguments which support the importance of so-called manual training as a general school subject. Aside from its informational value for the student of whatever future calling, the purely practical aspect of agriculture includes much more than merely a vocation. And this view of the subject is clearly set forth in a quotation from an official announcement of the Tennessee plan: Agriculture "is not only a business but a mode of life, and no preparation for that mode of life could be complete that does not include not only farm husbandry, or agriculture in its strictest sense, but also much of the manual training peculiar to rural pursuits, hygiene and agricultural economics, and even rural society, education, and general culture."

The need of providing special assistance and instruction for teachers who have not heretofore appreciated the educational value of agriculture in the common schools, recognized in this Tennessee plan of agricultural extension work, is receiving increasing recognition in

a number of other States. Thus Louisiana, for example, has recently made provision for a chair of agricultural education with Prof. V. L. Roy, formerly parish superintendent of Avoyelles Parish, as the first incumbent. One-third of his salary is assumed by the State Board of Agriculture, one-third by the State Department of Education, and the remainder by the State university. He is expected to work under the coordinate direction of these three authorities in bringing agricultural instruction into the secondary and elementary schools of the State.

As a means of encouraging the establishment of agricultural courses in high schools, a system of recognition of certain high schools for State aid has also been established. Each of these schools receives $500 annually from the State treasury on condition of meeting certain specified requirements concerning laboratory equipment, the course of study, and the selection of a competent man to give the instruction in agriculture. Twenty-five schools have already applied for such recognition, and probably at least twelve, properly distributed over the State, will ultimately receive it. Last year the State superintendent held a number of summer normal courses for the benefit of new teachers of agriculture, and at least five such courses will be given this year.

A chair of rural education has also been established in the University of Missouri, with Prof. R. H. Emberson in charge. Professor Emberson's time will be given entirely to the rural school problem, and his business will be to bring the college of agriculture and the rural school into close touch and sympathy, to introduce agriculture into the curriculum, to assist teachers in making this work successful, and to interest the boys of the school in corn growing, corn judging, live-stock judging, and such other subjects as may be found feasible. His work will all be in the field.

Within a few weeks Minnesota has adopted a definite policy for the encouragement of vocational teaching in its public schools. A bill passed by the legislature appropriates $25,000 a year for the next two years to encourage the establishment of agricultural departments in State high schools and graded or consolidated rural schools. These agricultural departments must be provided with trained teachers of agriculture, manual training, and domestic science, and with not less than 5 acres of land for educational and experimental purposes. Schools which have met these requirements (not to exceed one in a county nor ten in the State in any one year), and have been designated by the State High School Board to receive State aid, will get an amount equal to two-thirds of their actual expenditures upon departments of agriculture, provided that State aid shall not exceed $2,500 a year for any one school.

Still another example tending in the same general direction is furnished by the State of Texas, whose legislature has voted $32,000 to

subsidize agricultural instruction in the public high schools, besides providing $5,000 for each of the three State normal schools with which to maintain courses in agriculture and manual training. In addition to this, agricultural instruction is also to be given in six summer normal courses for public school teachers, three of these courses being assigned to the three normal schools, one to the State university, one to the State College of Agriculture and the Mechanic Arts, and one to the College of Industrial Arts (for women) at Denton.

One other case is noteworthy in this connection, that of the establishment this year of Arkansas' first State normal school with a distinct department of agricultural instruction, supervised by an agricultural college graduate, Prof. L. A. Niven. And in anticipation of the competent teaching service which this department is to develop in its graduates, the legislature has also appropriated $160,000 for establishing at least four agricultural high schools in the State.

These new developments furnish additional evidence of a vigorous movement throughout the whole country for bringing agricultural teaching into all normal schools, as a means of spreading its introduction through their graduates into the common schools of the people. The following States, named in the chronological order of their action, have already crystallized this general tendency by appointing professors or assistant professors of agricultural education either in the State university or the State college: Illinois, Tennessee, Massachusetts, Oklahoma, Michigan, Indiana, and Louisiana. Mississippi has a professor of industrial pedagogy, supervising work in agriculture and mechanic arts, and several other States (as Iowa) have developed extension departments that aim to bring agricultural instruction into all the secondary schools as rapidly as practicable.

So it has come to pass that no single State can hope to gain or maintain a position of distinct precedence in agricultural education extension work; rather each must needs take heed lest it find itself already superseded in rank by one it had supposed to be far in the rear of the movement. And none are awaking sooner to the significance of this movement than the people who have not had superior educational advantages, who are not wont to be enthusiastic over the technics of education, but who are keenly alive to its practical (or impractical) tendencies and results. While these people have not been backward in asking for a type of education practically related to their own conceived needs, they have not usually assumed to formulate its requirements into a working course of study. This duty still remains to be done by men already experienced in the schools; but its real value will be pretty accurately and promptly gauged by the patrons for whom the schools in fact exist.

This consideration emphasizes the importance of spreading the work of educating teachers who shall be qualified both pedagogically and practically for shaping this new educational development to meet the prevailing needs in each State and locality. In some States the new work can probably best be done through the State university, in others by the agricultural college, the agricultural high schools, the State normal schools, or all of these in cooperation. In other States, like New York, Michigan, and Nebraska, it can be advantageously dealt with in the county normal training classes. And in still other conditions, as in Iowa, the movable institute school of instruction may prove most serviceable, especially in the earlier stages of extension development. In all these cases the essential desideratum is so to rationalize our methods of industrial and extension instruction as to bring them into effective coordination with the standard educational systems that have amply demonstrated an enduring value.

Recent remarks of King Edward in relation to the inclusion of applied science and agriculture in the scheme of university education are interesting as reflecting an attitude in England which is becoming more widespread. At the opening of the new buildings of the University of Leeds in July, 1908, he said:

"The high standard of moral and intellectual discipline for which our schools and universities have been distinguished has not been lowered, nor has the pursuit of literary and historical studies been checked, by the inclusion in the university curriculum of those scientific studies, and especially of those branches of applied science for which such ample provision has now been made. I rejoice to think that the opportunities open to the young men of our great industrial communities of acquiring a knowledge of subjects of commercial utility in an atmosphere of academic culture are being so greatly increased, and I find it difficult to express my appreciation of the manner in which the great responsibilities which rest with the authorities and teachers of a university such as this have been discharged. It is a source of pleasure to me to know that you have provided also for the study of the theory and practice of agriculture, for I am convinced that the best possible results can not be derived from the industry and natural ability of our farmers unless they are properly instructed in the scientific aspects of their work."

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

The rusting of iron, W. A. Tilden (*Jour. Chem. Soc. [London], 93 (1908), No. 549, pp. 1356–1364, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 131, p. 648*).—Experimental evidence is presented to support the following conclusions: "Commercial iron, liquid water, and oxygen are together sufficient for the production of rust. Carbon dioxid is not necessary, but when present hastens the action. Commercial iron is attacked by pure water in the absence of oxygen and carbon dioxid, the product being, not rust, but ferrous hydroxid. Iron rust always contains ferrous oxid. The process of rusting is due initially to electrolytic action resulting in the production of ferrous hydroxid or carbonate. This may be explained by the presence in all ordinary iron of various components which afford surfaces at different potentials in the presence of water, aqueous carbonic acid, or other electrolyte."

Rusting of iron, J. N. Friend (*Jour. Iron and Steel Inst., 77 (1908), pp. 5–32; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 131, pp. 648, 649*).—The electrolytic theory of corrosion of iron is held to be untenable. General rusting is held to be primarily acid attack due to the presence of carbon dioxid with moisture and oxygen. Cast iron only is attacked by pure cold or boiling water. The purer forms of iron are not attacked by pure water and air or steam and air at 100° C. The corrosive action of rust is dependent upon its hygroscopic nature, resulting in the absorption of moisture and carbon dioxid from the air which continue the corrosion.

Corrosion of iron, C. F. Burgess (*Trans. Amer. Electrochem. Soc., 13 (1908), pp. 17–54; abs. in Sci. Abs., Sect. A—Phys., 11 (1908), No. 131, p. 648*).—Strained parts of mild steel corrode more rapidly than unstrained. Annealing at 900° C. removes this difference. Oxygen in boiler water promotes corrosion more than carbon dioxid.

The principles and results of plant chemistry, I, II. Euler (*Grundlagen und Ergebnisse der Pflanzenchemie. Brunswick, 1908, pp. IX+238, dgm. 1*).—In this text-book, which it is stated is revised from the Swedish edition, present knowledge regarding plant chemistry is summarized and digested. The principal subdivisions are nitrogen-free aliphatic compounds, nitrogen-free cyclic compounds, and nitrogenous compounds. Full indexes add to the usefulness of the volume.

Concerning the value and synthesis of protein, F. Hofmeister (*Arch. Expt. Path. u. Pharmakol., 1908, Sup., pp. 273–281*).—A digest of data on the structure of the protein molecule.

Milk proteins, G. A. Olson (*Jour. Biol. Chem., 5 (1908), No. 2–3, pp. 261–281*).—Recent investigations on milk enzyms and proteolytic bacteria are reviewed. The author found in milk, cream, and butter a new protein, which contains 18.93 per cent of nitrogen, gives a biuret reaction, and is dissolved in weak sodium hydroxid solutions. It was first found in the filtrate of separator slime after the casein and albumin had been removed, and can be isolated by

the addition of one part concentrated hydrochloric acid to five parts of that filtrate.

"Physically the new protein possesses a brown varnish-like luster which when pulverized is changed into a whitish appearance. In water it swells and takes on a whitish appearance.

"When added to milk a part of the casein is digested in the same. Digestion is most favorable in neutral milks on prolonged standing.

"Physiologically the enzymic properties are most active at a temperature of 65° C. At 80° C. the ferment was destroyed.

"The filtrate obtained after the removal of the new protein also has digestive properties.

"The influence of chemicals and sterilization tend to slightly modify the soluble nitrogen compounds of the milk.

"The addition of digestive bacterial cultures to sterilized milk in the presence of chloroform caused proteolysis.

"The decomposition products formed in the presence of the new protein are similar to those formed in the presence of galactase and bacterial enzyms under the same conditions. From these facts it is believed that the characteristic digestion of the new protein and galactase are of bacterial origin.

"The enzymic property of the new protein is one of incorporation."

Hydrolysis of hordein, A. Kleinschmitt (*Hydrolyse des Hordeins. Inaug. Diss. Univ. Heidelberg, 1907, pp. 33; abs. in Biochem. Zentbl., 7 (1908), No. 21–22, p. 804*).—Hordein, the chief protein of barley, differs from other known products, according to the author's conclusions, but is closely related to both gliadin and zein, being midway between the two in its characteristics.

The article contains data on the cleavage products obtained from hordein by germination as compared with those of acid cleavage.

A reaction distinguishing phosphoprotein from nucleoprotein and the distribution of phosphoproteins in tissues, R. H. A. Plimmer and F. H. Scott (*Jour. Chem. Soc. [London], 93 (1908), No. 552, pp. 1699–1721*).—According to the authors the results of their experiments show that "phosphoproteins may be distinguished from nucleoproteins by the action of 1 per cent sodium hydroxid at 37° for 24 to 48 hours; the phosphorus is completely separated in this time as inorganic phosphoric acid.

"Phosphoproteins are present in milk, egg yolk, and in the ova of fishes, that is, in the substances which constitute the food stuffs of the embryo bird and fish and the young mammal.

"A small quantity of phosphoprotein is present in the pancreas."

A modification of the character of gluten in the presence of sulphurous acid, J. Dugast (*Compt. Rend. Acad. Sci. [Paris], 146 (1908), No. 24, pp. 1287, 1288*).—The author concludes that sulphurous-acid gas produces a great change in the character of gluten and modifies its baking qualities.

The constitution of starch, Z. Gatin-Gruzewska (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 4, pp. 178, 179; abs. in Biochem. Zentbl., 7 (1908), No. 21–22, p. 765*).—The addition of concentrated potassium hydroxid solution and a little alcohol to warm starch paste caused a precipitate which is identical with the amylopectin of other investigators. From the filtrate another body was isolated, called by the author amylon, which is soluble in water. The properties of these bodies were studied. Previous work has been noted (E. S. R., 20, p. 110).

Further studies on the forms of milk sugar, C. S. Hudson (*Jour. Amer. Chem. Soc., 30 (1908), No. 11, pp. 1767–1783, figs. 2*).—The solubility relations of milk sugar, the vapor pressures of saturated solutions of hydrated milk

sugar, the influence of concentration on the equilibrium between the forms of milk sugar, and other similar questions were studied.

On the sugar of colostrums, J. Seelien and E. Sunde (*Ztschr. Angew. Chem., 21 (1908), No. 50, pp. 2546–2551*).—Unlike the fats and proteids the carbohydrates of colostrum are similar to those of normal milk.

Preparation of a standard solution of litmus and the making of litmus media, C. W. Brown (*Michigan Sta. Rpt. 1908, pp. 127–129*).—A standard was prepared by dissolving 2.5 gm. of azolitmin in 100 cm. of distilled water. Litmus was then dissolved in distilled water, heated, filtered, and the filtrate compared with the standard. From experiments with different samples of litmus it appeared that there was a close correspondence between the solubility and the strength of the blue solution.

The determination of nitrogen, F. Taurke (*Chem. Ztg., 32 (1908), No. 97, p. 1176; abs. in Jour. Chem. Soc. [London], 96 (1909), No. 555, II, pp. 91, 92; Chem. Abs., 3 (1909), No. 7, p. 759*).—The author proposes to use in the Kjeldahl method a burette graduated as usual on one side from 0 to 50 cc. and on the other from 25 cc. at the top to 0 at the bottom. Using half-normal acid, fourth-normal alkali, and an aliquot of solution corresponding to 0.7 gm. of substance the readings of the latter scale give percentage of nitrogen directly.

Report of the committee on the analysis of phosphate rock, C. F. Hagedorn et al. (*Jour. Indus. and Engin. Chem., 1 (1909), No. 1, pp. 41–44*).—This is a summary of the report of the committee on this subject appointed by the National Fertilizer Association.

Comparative tests by a number of different analysts of the official gravimetric method, the so-called Pemberton volumetric method, the citrate method, and the Gladding method for phosphoric acid, and the Smith, Gladding, acetate, Glaser, and Wyatt methods for iron and alumnia are reported.

Good results with the volumetric and the Gladding methods are reported, but the conclusion reached is that "at this time there are not sufficient reasons for substituting either of these for the present official method.

"In the case of the methods for iron and alumina, the results indicate that the methods most generally used are those employing a KOH solution in the separation of the iron from the alumina, viz, the Smith and the Gladding methods. In the other methods, the iron and alumina was determined by weighing the combined phosphates. Of these the acetate and the Glaser methods are the most important, and it is our opinion that some modification of the acetate method could be worked out which would be extremely satisfactory, as it appeals to chemists on account of its simplicity as compared with other methods."

Volumetric determination of phosphoric acid in fertilizers, R. Williams (*Chem. Engin., 8 (1908), pp. 97–99; abs. in Analyst, 33 (1908), No. 393, p. 483*).—Objections to the American official volumetric molybdate method are stated and modifications of the method to overcome these objections are described.

In the modified method the total phosphate is precipitated in an aliquot part of the acid solution containing as slight an excess of acid as possible, by adding 1 cc. of mixed ferric and calcium chlorids (10 per cent of each in solution) and sufficient ammonia to render the solution slightly alkaline; 150 cc. of boiling water is then added, the liquid allowed to settle, and filtered. The precipitate is washed once with hot water, then dissolved in 100 to 125 cc. of hot dilute nitric acid (70 cc. of strong acid in 1 liter). The solution is nearly neutralized with ammonia, precipitated with 30 to 35 cc. of molybdate solution, added to the stirred hot liquid, and the process carried out as in the official method.

The determination of cotton-seed hulls in cotton-seed meal, G. S. Fraps (*Amer. Fert., 29 (1908), No. 6, pp. 30, 31*).—Noted from another source (E. S. R., 20, p. 510).

Detection and determination of nitric acid in water and sewage, KLUT (*Mitt. K. Prüfungsanst. Wasserver. u. Abwässer. Berlin, 1908, No. 10, pp. 85–101; abs. in Chem. Ztg., 32 (1908), No. 97, Report., p. 632; Brewers' Jour., 33 (1909), No. 3, p. 107; Gesundhts. Ingen., 32 (1909), No. 16, p. 271*).—As a qualitative test for nitric acid brucin is preferred to diphenylamin. For quantitative determination the Schulze-Tiemann method is recommended. The Ulsch method is considered the next best.

The determination of calcium carbonate in soils by the Bernard and Treitz method and its importance in the selection of vineyard soil, K. VOTRUBA (*Allg. Wein Ztg., 1908, No. 30, pp. 1–4; abs. in Chem. Zentbl., 1908, II, No. 12, pp. 1065, 1066; Jour. Chem. Soc. [London], 96 (1909), No. 555, II, p. 95*).—The Treitz method, which depends upon the determination of the calcium carbonate removed in suspension when soil is shaken with water, is preferred to that of Bernard as a means of selecting vineyard soils. The lime in fine soil is apparently of more importance than that in coarse lumps. Account must also be taken of other physical properties in selecting vineyard soils.

New method for the estimation of lactic acid in animal organs and fluids, E. JERUSALEM (*Biochem. Ztschr., 12 (1908), No. 5–6, pp. 361–389, figs. 2; abs. in Analyst, 33 (1908), No. 393, pp. 474, 475*).—The author extracted the lactic acid with ether and then oxidized by permanganate. The aldehyde formed is estimated by the iodoform method.

The quantitative estimation of creatinin in urine, G. EDLEFSEN (*München. Med. Wchnschr., 55 (1908), No. 49, pp. 2524–2527*).—A critical discussion of methods and a description of the procedure which the author recommends.

The determination of reducing sugars from the weight of cuprous oxid, C. A. BROWNE (*Internat. Sugar Jour., 10 (1908), No. 119, pp. 537–540*).—According to the author's experiments, it is more accurate to weigh copper in sugar determinations as CuO than as Cu_2O.

The precipitation of reducing sugars with basic lead acetate, A. H. BRYAN (*Internat. Sugar Jour., 10 (1908), No. 120, pp. 602–605*).—A contribution to the subject of methods.

Errors in the polarimetric determination of sucrose, when lead salts are used as clarifying agents (*Internat. Sugar Jour., 10 (1908), No. 120, pp. 581–583*).—A digest of recently published data on this subject.

Refractometer studies, F. G. WIECHMANN (*Internat. Sugar Jour., 10 (1908), No. 119, pp. 545–554*).—From the large number of determinations reported the author concludes that "if the refractometer is to find a permanent place in the sugar laboratory, it will be necessary to prepare a table of the refractive index values of chemically pure sucrose solutions, at some standard temperature, say at 20°."

The determination of nonsaccharin organic material in cane molasses, J. J. HAZEWINKEL (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 4, pp. 230–247*).—A study and comparison of methods. According to the author's observations, large quantities of mannose and glucose do not exist in defecation molasses.

The resorcin hydrochloric acid reaction and its value in honey analyses, RIECHEN and I. FIEHE (*Chem. Ztg., 32 (1908), No. 90, pp. 1090, 1091*).—The authors defend this reaction from the criticisms which have been made of it and state that their studies of the reaction are being continued.

The estimation of salt in imported pickled meat, G. GRÖNING (*Ztschr. Fleisch. u. Milchhyg., 19 (1908), No. 1, pp. 12–15, fig. 1*).—The author describes the apparatus and method which he has found convenient.

The detection of white corn flour in wheat flour products, E. CARLINFANTI and G. SALVATORI (*Arch. Farmacol. Sper. e Sci. Aff., 6 (1907), No. 8–9, pp. 458–*

468; abs. in Biochem. Zentbl., 8 (1908), No. 1–2, pp. 91, 92).—The method described depends upon the determination of the nitrogen content of the material extracted by iso-amyl alcohol.

An analysis of cloves, T. R. Hodgson (*Amer. Jour. Pharm., 81 (1909), No. 1, pp. 6–9*).—According to the author, the three determinations on which the greatest reliance can be placed in the analysis of cloves are ash, nitrogen, and oxygen equivalent. "The determination of the alcoholic extract is of no practical value, the determination of the crude fiber and moisture may in some cases be of considerable use, whereas in others it may be of no value whatsoever; the determination of the ether extract is advisable."

Judging black pepper, G. Graff (*Ztsch. Öffentl. Chem., 14 (1908), No. 22, pp. 425–447*).—According to the author's analytical studies and critical summary of the work of other investigators, the determination of crude fiber content, in addition to the ash and sand content, affords the best data for judging the quality of pepper. He recommends that 17 to 17.5 per cent crude fiber be adopted as a standard for whole and ground pepper.

The sanitary composition of cow's milk, M. Donsett (*Pure Products, 5 (1909), No. 1, pp. 7–10*).—The author insists that milk inspection not be confined to the content of nutrients, but should extend to the dirt content. The sedimentation and the Gerber filtration methods of estimating dirt content in milk are described.

The examination of milk for dirt and leucocytes, C. Revis (*Jour. Roy. Inst. Pub. Health, 16 (1908), No. 12, pp. 734–740*).—Methods now in use are described, together with a new method for estimating the dirt content which has been devised by the author. In this the sample of milk is centrifuged and treated with eau de Javelle to dissolve the leucocytes.

The determination of the Reichert-Meissl number by saponification with glycerin-potash, M. Siegfeld (*Chem. Ztg., 32 (1908), No. 93, p. 1128*).—The author prefers to saponify with potash rather than with soda. Comparative results with the two alkalis are given.

The analysis of cacao butter, G. Halphen (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 8, pp. 345, 346; abs. in Analyst, 33 (1908), No. 393, p. 468*).—The author describes a method of detecting vegetable fats based on the difference in solubility of the respective bromin derivatives.

The estimation of cocoanut oil in butter, R. Ross (*Analyst, 33 (1908), No. 393, pp. 457–463*).—This article contains results of investigations on insoluble fatty acids. The variations in the composition of different butters and cocoanut oils are so great that the fixing of reliable constants is not deemed possible.

A method for detecting synthetic color in butter, R. W. Cornelison (*Jour. Amer. Chem. Soc., 30 (1908), No. 9, pp. 1478–1481*).—A new method is described by the author in which the clear dry fat is melted in glacial acetic acid. The clear acid is drawn off and tested with concentrated nitric acid, sulphuric acid, and sulphuric acid and ether. The results of the author's investigations are given.

The Rabild tube (*N. Y. Produce Rev. and Amer. Cream., 27 (1908), Nos. 5, p. 178; 7, p. 285*).—This tube is made for the purpose of making a rapid calculation of overrun in butter. Some butter makers use it for estimating the moisture content, but it is stated that as accurate results can not be obtained it can not be recommended for this purpose.

Some of the constituents of saffron and a method for the valuation of saffron, B. Pfyl and W. Scheitz (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 6, pp. 337–352; abs. in Analyst, 33 (1908), No. 393, pp. 472, 473*).—The authors isolated two sugars and a substance similar to the picrocrocin of Kayser from the petroleum spirit and the chloroform extracts of pure saffron.

The valuation of saffron may be estimated by the amount of reducing sugars present.

Composition of white lead and paints, G. S. FRAPS (*Texas Sta. Bul. 114, pp. 5–11*).—This bulletin describes standard pigments and oils and adulterant paint materials. Analytical data of paint materials are also reported.

"Eleven samples of so-called white lead were examined. Four were pure and 7 adulterated or substitutes. Two did not contain any white lead and 3 did not contain over 5 per cent.

"Fourteen samples of mixed paints were examined. Four were pure lead and zinc paints. Six samples contained 10 to 15 per cent carbonate of lime, 3 contained 36 to 58 per cent barium sulphate, and 1 contained 15 per cent carbonate of lime and 15 per cent clay.

"Two of these paints contained benzine as an inferior substitute for turpentine; some appeared to contain linseed oil adulterated with resin oil, and 1 contained linseed oil adulterated with a mineral oil."

Report of State chemist, H. G. KNIGHT (*Ann. Rpt. Dairy, Food and Oil Comr. Wyo., 4 (1908), pp. 36–85*).—During the fiscal year ending October 1, 1908, 651 samples of food, drugs, drinks, and illuminating oils were collected and examined. Of these 532 were passed and 119 declared adulterated or misbranded.

Extracts from the proceedings of the Association of Official Agricultural Chemists, 1908 (*U. S. Dept. Agr., Bur. Chem. Circ. 43, pp. 16*).—This contains the reports of the committees on recommendations of referees, with the action taken by the association in each case, together with resolutions adopted and a list of the officers, referees, and committees for the year 1909.

METEOROLOGY—WATER.

Relation of weather conditions to growth and development of cotton, J. B. MARBURY (*Cotton, 73 (1908), No. 2, pp. 51–53, figs. 5; 73 (1909), No. 3, pp. 88–90, figs. 3*).—It is stated that "cotton, though a sensitive plant, is of all summer-growing crops of the South about the least affected by ordinary changes in the weather. Its long period of growth, fruiting, and maturity affords it ample opportunity to recover from a number of temporary setbacks. During the protracted season from planting in April to the completion of its harvest in November it is exposed to many varieties of weather, and it seems to endure the bad as well as enjoy the good. Such a thing as 'half a crop' is unknown. Statistics show that the crop is seldom curtailed by more than one-fourth or one-third."

The relation between rainfall and temperature and the growth of cotton at different periods is explained in diagrams and in the text. Rainfall seems to be the stronger influence in the development of the cotton plant. "Well distributed showers during the spring months serve to keep the soil in a condition well suited for the best development of the young plant and to cause the roots to sink deep into the earth, thus enabling the plant to maintain itself against the dry periods of the following summer. A very wet spring causes the development of a large number of the surface roots to the sacrifice of those roots which naturally tend downward, and the droughty conditions which prevail frequently during the summer soon cause the plant to wilt and shed its foliage and fruit, since the dry surface soil does not furnish sufficient nourishment for its growth." Sunshine is also an important factor. The author states that "the normal conditions of temperature and rainfall throughout the cotton belt are, as a rule, most favorable for the proper development of this delicate plant. April and May, with less than 4 in. of rain each, cause the tap root to sink deep

into the soil, so that sufficient moisture is brought up from below to satisfy the demands of the plant later in the season, when the weather is dry and sunshine prevails. The temperature during June and July is also a very important factor, averaging about 78° for the former month and 80° for the latter. There is a marked uniformity in the average temperature among all the States in the cotton belt."

When the bolls begin to open (in August) "an abundance of light, well distributed showers and warm sunshine is needed. If too much rain falls, the results are peculiarly disastrous; the weed will begin to grow rapidly, to the detriment of the fruit; the plant will cease to make new blooms and the squares already formed will drop; the bolls will decay on account of the accumulated moisture which they absorb; the fiber in the open bolls will be either beaten out or discolored.

"September and October are the months for picking, and, of course, dry weather is needed. Only sufficient moisture is then required to nourish the growing bolls and opening flowers, and much of this can be secured through the roots, provided the weather early in the season has been such as to cause the roots to penetrate deep into the soil. Under normal conditions the rainfall is very light during the months of September and October throughout the major portion of the cotton belt, affording fine opportunity for securing the matured crop."

An analysis is given of weather conditions during years of greatest yield.

Periodical variations in climate, G. Meyer (*Gaea, 44 (1908), No. 10, pp. 588–591*).—This article attempts to show whether there is a relation between the moon and the weather. The general conclusion reached is that the phases of the moon have a greater and more certain influence upon variations in climate than the appearance of sunspots, at least for the region covered by the study reported.

Study of the results of hail shooting, L. Godinot (*Ann. Soc. Agr. Sci. et Indus. Lyon, 1907, pp. 82–92*).—This is a review of the present status of this subject based mainly upon official reports of government commissions appointed to investigate the matter.

Atmospheric humidity charts, A. Fröhlich (*Gsndhts. Ingen., 31 (1908), No. 50, pp. 790–792, charts 3*).—Charts showing the atmospheric humidity corresponding to different temperatures from —20 to 100° C. are given.

Report of the Chief of the Weather Bureau, 1906–7 (*U. S. Dept. Agr., Weather Bur. Rpt. 1906–7, pp. XLIII+402*).—As usual, part 1 of this document consists of an administrative report reviewing the operations of the Weather Bureau during the year and including statements regarding additions to equipment and extension of the work; part 2 gives a list of observing stations and changes therein during 1906, and twice-daily observations for 29 selected stations during 1906; part 3, monthly and annual meteorological summaries for 189 stations; part 4, monthly and annual means and annual extremes of temperature and dates of first and last killing frosts, 1906; part 5, monthly and annual precipitation, 1906, and monthly and seasonal snowfall, 1906–7; and part 6, miscellaneous meteorological tables and reports.

Among the more important subjects receiving attention during the year were research at Mount Weather, more particularly with reference to upper air investigations by means of kites, solar radiation, solar physics, and magnetism; forecasts and warnings; seismological observations; investigation of evaporation in connection with the Salton Sea (E. S. R., 19, p. 1112); river and flood service; climatological service; ocean meteorology; and wireless telegraphic weather service.

Meteorological observations (*Michigan Sta. Rpt. 1908, pp. 167–179*).—Tabulated daily and monthly summaries are given of observations during 1907 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc.

Meteorological records for 1907 (*New York State Sta. Rpt. 1907, pt. 1, pp. 333–343*).—Tables are given showing daily readings of maximum and minimum thermometers at 5 p. m. for each month of 1907; tridaily readings of the standard air thermometer during each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings; average monthly and yearly temperature since 1882; monthly and yearly maximum and minimum temperatures from 1883 to 1907, inclusive; and rainfall by months since 1882.

Some climatic features of the Territory of Hawaii, W. B. Stockman (*Honolulu Chamber Com. Ann., 1908, pp. 90–94*).—Data regarding temperature and rainfall are summarized, attention being called especially to the great diversity of climatic conditions in the Territory. These vary "from the eternal spring obtaining at sea level to the invigorating, ideal temperatures experienced at altitudes ranging from about 500 to 2,500 ft. on all the islands, and the freezing weather which obtains on the upper slopes of Mount Haleakala on Maui, and Mt. Mauna Loa and Mt. Mauna Kea on Hawaii; and from the torrential rains and moist atmosphere of the higher levels on the windward sides of all the islands to the light rainfalls and small percentage of relative humidity on the leeward sides.

"The topography and altitude of a place or district of these islands has a decided effect on its climatic conditions, but the controlling factor—other than latitude—is, perhaps, the directness with which the warm, moisture-laden trade winds pass over it, for any obstacle that deflects from their true course these winds—which here blow with great steadiness and considerable force—has a marked effect on the rainfall, and a modifying one on the temperature and humidity conditions."

Climatological data, J. N. Belfort de Mattos (*Sec. Agr. Com. e Obras Pub. Estado São Paulo, Secc. Met. [Pub.], Ser. 2, No. 4, pp. 6, pl. 1, charts 8*).—This is a record of climatological observations in the State of São Paulo, Brazil, during 1907.

Swedish meteorological observations, 1907, H. E. Hamberg (*Met. Iakttag. Sverige [Observr. Mét. Suéd.] K. Svenska Vetensk. Akad., 49 (1907), pp. X+159*).—This report is divided into 3 parts: (1) Daily observations at 18 stations of the second order, (2) monthly and annual summaries of all the meteorological elements furnished by 41 stations of the second order, and (3) 5-day means of temperature at the 41 stations included in part 2.

British rainfall, 1907, H. R. Mill (*London, 1908, pp. 100+280, pls. 5, figs. 25; rev. in Nature [London], 78 (1908), No. 2033, p. 604*).—This report is in the usual form and "deals with the distribution of rain in space and time over the British Isles during the year 1907, as recorded by more than 4,000 voluntary observers, and is supplemented by articles upon various branches relating to that subject."

Among the special articles are a discussion of the typical thunderstorms of July 21–22, "showing distinctly the linear arrangement of heavy rainfall in such storms and its disregard of the configuration of the land," and a note on mapping rainfalls (E. S. R., 20, p. 213). There are also discussions of droughts and rain spells.

Composition of Barbados rainfall (*Rpt. Agr. Work Barbados, Imp. Dept. Agr. West Indies, 1905–1907, pt. 1–2, p. 3*).—The amount and composition of the rainfall from December, 1905, to May, 1907, are given. "The total amount was

76.53 in. and supplied approximately 175 lbs. of chlorin and 9.5 lbs. of nitrogen per acre."

The chemistry of the River Nile, A. LUCAS (*Survey Dept., Egypt, Paper No. 7, pp. 78, dgm. 1, map. 1*).—This paper brings together what has already been published on the water of the Nile channels and the matter suspended in it (E. S. R., 18, pp. 421, 424; 19, p. 1013) as well as records of the results of further work recently done in the Survey Department laboratory of Egypt, and gives a brief outline of work on the water in the soil of the Nile Valley as a basis for future investigations. Appendixes give data on the following subjects: Bacteriology of the Nile water, preliminary microscopic examination of Nile silts, physical analyses of samples from well borings, chemical analyses of Nile water, and chemical analyses of water from desert wells. A bibliography containing 71 references to literature of the subject is given.

It is stated that "the whole body of underground water in the valley is simply a lateral continuation of that in the river and is in contact with it and supplied from it." Analyses of these underground waters show wide variations at different places. "This is only to be expected, since, owing to the varying nature of the soil through which the water percolates, it will naturally come into contact with, and will dissolve out, more salts in some places than in others."

Potable water and sewage (*Rev. Gén. Sci., 19 (1908), No. 22, pp. 905–908*).—This is a brief review of progress in methods of procuring pure water supplies and in disposing of sewage. Among the methods especially referred to are filtration through submerged and unsubmerged sand filters, rapid American filters, and sterilization by means of ozone and iron. The growing use, particularly in England, of the septic tank for disposing of sewage is also referred to.

On the rôle of bacteria in the biological methods of sewage purification, with special reference to the process of denitrification, W. MAIR (*Jour. Hyg. [Cambridge], 8 (1908), No. 5, pp. 609–653*).—The investigations reported in this paper were carried out in connection with an experimental plant built by the Corporation of Belfast for the purpose of discovering suitable methods of dealing with the sewage of that city. The investigations included "an examination of the experimental contact beds, and of the sprinkler, with reference to the disappearance of certain groups of bacteria," and a study of "the occurrence of denitrification in sewage with reference to the bacteria concerned in the process, with isolation in pure culture of certain of these bacteria and a study of their chemical effects upon nitrates."

The investigations on denitrification included more particularly the isolation and study of typical denitrifying bacteria, especially of the *Bacillus hyponitrosus* group, and the relation of the activities of these organisms to the purification of sewage.

It is thought probable "that in the contact beds a considerable proportion of the organic nitrogen disappears as gas as a result of alternate nitrification and denitrification. In the sprinkler the free exposure to air renders it unlikely that any appreciable amount of denitrification occurs." The general conclusion is reached "that the rôle of bacteria in the purification of sewage is a somewhat limited one, which by no means justifies the application of such terms as 'bacteria beds' and 'bacterial purification.' . . .

"There is, however, one other stage in the process which may with great probability be ascribed to bacterial action, the stage, namely, of nitrification," but the author finds it difficult in view of the results obtained in these investigations "to correlate the nitrification which occurs in nature, and in particular that which occurs in sewage purification, with the activity of" the nitrite and nitrate bacteria as isolated and studied by Winogradski.

SOILS—FERTILIZERS.

The mineral composition of soil particles, G. H. Failyer, J. G. Smith, and H. R. Wade (*U. S. Dept. Agr., Bur. Soils Bul. 54, pp. 36*).—This bulletin reports the results of chemical analyses of the soil separates of a number of soils covering all of the important agricultural areas of the United States, including soils of the Coastal Plains, soils from crystalline and metamorphic rocks, soils of glacial origin, derived from limestones and shales, and soils of the arid region.

The results obtained with the different groups of soils and with rocks, soils, and soil separates are compared.

The results are summarized as follows:

"As a general rule the smaller particles of soils are richer in potassium, calcium, magnesium, and phosphorus than the coarser particles.

"The concentration of these elements in the finer components is the more pronounced as the soils have undergone more extreme weathering.

"In glacial soils and others resulting largely from mechanical processes the coarser particles are relatively high in the percentage of potash, lime, and magnesia.

"The larger mechanical components contain these elements in forms which by protracted weathering will become more soluble, and they will ultimately be concentrated in the finer components.

"Calcium is often rather low in clay soils resulting from the weathering of hard, compact limestones. It is generally abundant in soils recently formed from easily broken down limestones. The sands of these latter soils may contain a high percentage of calcium, probably as lime sand or as coatings on other large mineral grains.

"A comparison of soils and soil separates with crystalline rocks indicates that in the process of the weathering of these rocks the phosphate remains of about the same proportion or slightly increases. The lime and potash seem to decrease in percentage, although minerals containing them are always present."

Contribution to the subject of kaolin formation, O. Hähnel (*Jour. Prakt. Chem., n. ser., 78 (1908), No. 17–18, pp. 280–284*).—The author concludes from his investigations that weathering and kaolinization are chemically distinct processes. The recent decomposition products of granite under humus were found to be very similar in composition to crude kaolin.

On the radioactivity of the soil, F. Bordas (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 20, pp. 924, 925; abs. in Rev. Sci. [Paris], 5. ser., 10 (1908), No. 22, p. 699; Jour. Chem. Soc. [London], 96 (1909), No. 555, II, p. 7; Chem. Zentbl., 1909, I, No. 3, p. 209*).—Observations are reported which show a decided radioactivity in soils of the Andean Plateau, and these observations suggest the possibility of a relation between this natural radioactivity and the formation of the large nitrate deposits in this part of Chile (Province of Aconcagua).

Soils of the United States, M. Whitney (*U. S. Dept. Agr., Bur. Soils Bul. 55, pp. 243, pls. 2, figs. 7*).—This bulletin contains a summary of recent soil investigations and a classification of the soils of the United States based upon the work of the Bureau of Soils to January 1, 1908.

"The first part consists of seven lectures covering the activities of the Bureau of Soils in the field and in the chemical and physical laboratories for the last nine years and discusses in a general way the most notable achievements during that period, coupled with suggestions for further research in the fundamental field of soil study." It sums up the more important of the conclusions of the Bureau, as in the main already published, regarding the nature

and properties, classification, and utilization of soils, fertilizers and manures, crop rotation, soil deterioration, and soil fertility as a national asset.

"Part II consists of descriptions of the soil provinces, soil series, and soil types, the last particularly from the standpoint of crop adaptation. The extent and the distribution of the soils of the United States are also shown, and the whole gives the complete classification of soils up to January 1, 1908."

The report is accompanied by a map showing the soil provinces in colors.

Soil investigations of the experimental fields at Aarslev Experiment Station, H. R. CHRISTENSEN (*Tidsskr. Landbr. Planteavl, 15 (1908), No. 3, pp. 383–406, dgms. 5*).—The investigations included mechanical and chemical analyses of 78 samples of surface soil and of 31 subsoil samples taken from three different fields. "Biological lime determinations," according to the Azotobacter method of the author (E. S. R., 18, p. 720), were also made in 30 samples of surface soil. The methods of sampling and analyses followed are described in detail in the report, and the results briefly discussed.

Data of analyses of some wet soils of lower Friuli and notes on their suitability for crop production, A. CARATTI and Z. BONOMI (*Ann. R. Staz. Sper. Agr. Udine, 9 (1908), pp. 57–72*).—A considerable area in the lower part of the province of Friuli is swampy and unfit for agricultural use. In connection with a project for draining this area, the authors took samples of soils at various points. The analyses of these samples are given, with some observations on the probable advance in value of the lands affected if the proposed drainage scheme is carried out.

Analyses of soils from the Eden district, F. B. GUTHRIE (*Agr. Gaz. N. S. Wales, 19 (1908), No. 10, pp. 838–844*).—Data regarding the physical and chemical properties of 9 samples of different kinds of soil from different parts of this district of New South Wales are reported and briefly discussed, particularly with reference to the improvement of the soils.

The meaning and value of the chemical analysis of soils, R. D. WATT (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 40–44*).—The terms used in stating soil analyses are defined and explained, and the average composition of 100 typical Transvaal soils examined during 1907 and 1908 is given as follows:

	Per cent.
Stones removed by 3 mm. sieve	2.59
Analysis of air-dry fine earth—	
Moisture	2.400
Loss on ignition (organic matter, etc.)	5.840
Insoluble matter (sand, etc.)	79.880
Oxid of iron and alumina	11.090
Lime	.240
Magnesia	.150
Potash	.190
Phosphoric acid	.055
Total	99.845
Nitrogen	0.1140
"Available" potash	.0113
"Available" phosphoric acid	.0069

The absorptive capacity of some Russian soils and of their finest particles as related to their composition, I. P. ZHOLTSINSKI (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 2, pp. 129–225*).—The experiments were made with three kinds of soils—a chernozem, a red soil, and a podzol (bleisand).

The general conclusions of the author are as follows: (1) Soils differing strikingly in origin, morphology, and composition show in the majority of cases no less marked differences in their absorptive capacity. (2) The peculiarities of the absorptive capacity of each soil are reflected to a certain degree, and frequently very clearly, in its finest particles (clay). (3) The finest group of soil particles, the body of which presents a close combination of zeolitic clay with organic-mineral substances, possess a high absorptive capacity sometimes approaching the maximum limit. (4) The absorptive capacity of a soil does not show any parallelism with reference to ammonia, phosphoric acid, and lime. Soils absorbing much ammonia may take up little lime and phosphoric acid and inversely. A parallelism was observed only with reference to ammonia and potash. The fine particles and the soils deprived of them retain this peculiarity. (5) The maximum absorptive capacity with reference to potash and ammonia is possessed by soils richest in humus—chernozem; with reference to phosphoric acid, by soils rich in iron—red soils. The fine particles and soils deprived of part of the latter retain these peculiarities. With reference to lime the maximum absorption was shown by the red soils, but this phenomenon is not constant in its nature. (6) The presence of substances forming the ortstein (organic compounds of iron) in podzols considerably heighten the absorbing capacity of the podzol with reference to phosphoric acid; in the fine particles of the podzol this phenomenon is strongly accentuated. (7) The conclusion of Heiden, Krat, and others that no soil exhausts a solution completely is not correct with regard to weak solutions of phosphoric acid. (8) Between the amount of ammonia absorbed by the soils and clays and their contents of hygroscopic water there is a certain parallelism which is masked, however, by other factors in very poor soils (podzol) containing very little hygroscopic water. (9) Between the mechanical composition of the soils and their absorptive capacity there is a certain dependence which is the more marked the less it is masked by other factors. The clay and in general the mechanical fraction less than 0.01 mm. in diameter is of the greatest influence.

The pulverization and exhaustion of the soil in black fallow culture, S. Kulzhinski (*Khozyaystvo, 1906, No. 23; abs. in Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *9* (*1908*), *No. 2, p. 311*).—The author calls attention to the lowering of yields of winter cereals on black fallow as compared with the April fallow and even with the May fallow, on the unfertilized three-course rotation section of the Poltava Experiment Field.

This lowering began to be observed from the year 1900, when the third cycle of the rotation was commenced. Earlier, in the period 1895–1899, the winter cereals on the black fallow gave the highest yield. The data for moisture in the upper layer of the soil show that in the period 1895–1899 it was higher under the winter cereals on the black fallow than in the April fallow, while the reverse was the case in the period 1899–1904. The mechanical analysis of the soil in the later period gave in the black fallow more silt particles and considerably less clay particles than in the April fallow. The chemical analysis showed more humus, nitrogen, and phosphoric acid in the April fallow than in the black. It was found that at the time of the cultivation of the fallow nitrification was strongest in the black fallow but weakest in the spring.

On the basis of these data the author supposes the diminution of the yield of the winter cereals on the black fallow to be due to the fact that, owing to the intensified mellowing in the black fallow cultivation, the soil undergoes more weathering and pulverization. In consequence higher crops are at first obtained on black fallow than on other fallows. Then as the soil becomes exhausted by such high yields and its physical properties deteriorate (due to very fine pulverization), conditions arise which are unfavorable for the accumu-

lation and conservation of moisture and for the formation of nitrates, and the lowering of the yield is the result.

Productivity of the black fallow in the steppes as dependent upon precipitation and the fertility of the soil, L. P. Sokalski (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 4, pp. 449–472*).—It has been well established that in the steppes with their dry climate black fallow cultivation is the safest means of insuring a satisfactory crop. The favorable influence of the black fallow has been generally ascribed to the circumstance that thereby moisture is best accumulated and conserved. This view the author subjects to a critical study, making use of the data accumulated during a number of years at the experiment stations of Kherson, Odessa, and the Don region.

He finds that there seems to be no connection between the crops of winter wheat and either the annual amounts of precipitation or the precipitation during the growing period. There is, however, a direct relation between the precipitation during the spring months and the crop of winter wheat. The ratio expressing this relation forms the coefficient of productivity. With the aid of this coefficient the size of the crop in a given locality can be predicted in May.

In the opinion of the author, the accumulation of moisture, if such a condition is brought about by the black fallow cultivation, does not affect the productiveness of the soil. He thinks that the favorable effect of the black fallow culture is due to the fact that this mode of culture increases the availability of the nutritive substances of the soil.

Brief report of the Poltava Experiment Field for 1907, S. Tret'yakov and Verbetski (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 2, pp. 308–311*).—Data for 12 years show that larger yields were obtained on early fallow than on black fallow.

Brief report of the Kherson Experiment Field for 1906, F. Yanovchik (*Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 2, pp. 306–308*).—Mean results for 15 years gave better crops of winter wheat and rye on early fallow than on black fallow. Experiments on different modes of cultivation, fertilizing, etc., are described.

Fertility of various horizons of the soil, V. Sazanov (*Trudui Ivanov Selsk. Khoz. Opuitn. Stantzii, 1907, No. 3, pp. 111–122; abs. in Zhur. Opuitn. Agron. [Russ. Jour. Expt. Landw.], 9 (1908), No. 2, pp. 302, 303*).—Vegetation experiments show that the fertility of the soil tested diminished from the upper to the lower layers.

Zeolites and similar compounds, their constitution and importance in technology and agriculture, R. Gans (*Jahrb. K. Preuss. Geol. Landesanst. u. Bergakad. Berlin, 26 (1905), No. 2, pp. 179–211; abs. in Chem. Abs., 2 (1908), No. 23, p. 3216; Jour. Soc. Chem. Indus., 28 (1909), No. 2, p. 102*).—The character of zeolitic silicates extracted from different kinds of soils are described and classified according to the substitution of their bases, as, for example, by ammonia. From a study of these and other changes the conclusion is reached that a fertilizer containing phosphates or carbonates is preferable to one containing sulphates and nitrates because with the former there is no unnecessary exchange of bases in the zeolitic compounds of the soil. Other results from exchange of bases due to addition of various fertilizing materials are given.

Soil moisture, A. Lehmann (*Dept. Agr. Mysore, Ann. Rpt. Agr. Chem., 8 (1906–7), pp. 25–30, 57, 58*).—The results of studies of the effect on soil moisture of different kinds and amount of cultivation are reported, and indicate that keeping the surface of the soil loose not only conserves the moisture of the soil but has other beneficial effects.

[Effect of soluble salts in the soil on the growth of sugar cane], J. B. HARRISON (*West Indian Bul., 9 (1908), No. 1, pp. 19–37; abs. in Internat. Sugar Jour., 10 (1908), No. 118, pp. 500–509; Chem. Ztg., 32 (1908), No. 87, Repert., p. 554*).—The author discusses, on the basis of experiments extending over a number of years, the effects of long-continued applications of sulphate of ammonia and nitrate of soda on the productiveness of the soil, the effects of cultivation and of manures on the composition of the soil waters of the sugar cane fields, the relation between temporary and permanent alkalinity of soil waters, the proportion of nitrogen in tropical soil waters, and the concentration of the subsoil water.

The general reaction of the fertile heavy clay soils of British Guiana is slightly alkaline, and a decided and comparatively rapid increase of the alkaline salts in the soils under experiment was observed. This concentration of salts exerts a decidedly injurious effect on the physical properties of the soil and on the growth of cane, but promotes the activity of nitrifying organisms. The alkalinity of the soil may explain why sulphate of ammonia gives better results than nitrate of soda when applied in large amounts. The remedies suggested by the author's experiments are deep drainage and the application of gypsum, calcium phosphates, and other neutralizing materials.

The isolation of harmful organic substances from soils, O. SCHREINER and E. C. SHOREY (*U. S. Dept. Agr., Bur. Soils Bul. 53, pp. 53, pls. 4*).—This bulletin presents briefly the evidence of the occurrence of harmful substances in the soil, reviews previous attempts to isolate the toxic compounds, and reports investigations relating to the isolation and toxic properties of a number of organic bodies, products of the decomposition of organic matter of vegetable and animal origin, in unproductive soils.

The isolation of four well-defined crystalline bodies is reported. The first of these, picolin carboxylic acid (E. S. R., 19, p. 419), possesses faint acid properties and also has the power of acting as a base toward strong acids. In experiments with wheat seedlings it was found to be harmful in concentrations of 100 parts per million, but like many poisons had a stimulating effect when present in small quantities.

A second body, dihydroxystearic acid, isolated from unproductive soils (E. S. R., 20, p. 704) "was injurious in all concentrations tested and ultimately caused death of the plants in concentrations of 100 parts per million."

The two other crystalline bodies isolated were agrosterol and agroceric acid (E. S. R., 20, p. 509). "Neither of these substances appears to be harmful to wheat and [they] are of interest in the study of soil fertility chiefly with regard to their possible connection with the generation or destruction of injurious or beneficial compounds, although it is not impossible that they may be themselves harmful to plants other than that tested."

The nitrogen problem, R. PEROTTI (*Bol. Quind. Soc. Agr. Ital., 13 (1908), No. 23, pp. 1186–1196; 14 (1909), Nos. 2, pp. 48–62; 3, pp. 84–100*).—This is a general discussion of the natural processes by which the soil acquires or loses nitrogen. Under the head of gain of nitrogen, bacteria, molds and algæ, and legumes are considered, and under loss volatilization of ammonia and denitrification are briefly treated.

Practical methods of promoting the natural processes of increasing and conserving the nitrogen supply of the soil are also discussed.

Leguminous plants as fixers of the nitrogen of the air, M. PASSON (*Bol. Inst. Agron. [São Paulo], 1 (1908), No. 10, pp. 345–349, fig. 1*).—Data are given for yields and nitrogen content of velvet bean, cowpea, and peanut, showing the amounts of nitrogen accumulated by crops of these plants.

[Inoculation for leguminous plants], H. A. HARDING (*New York State Sta. Rpt. 1907, pt. 3, pp. 116, 117, pl. 1*).—In a review of the bacteriological investigations of the New York State Station, the results of tests of commercial cultures for leguminous plants and of experiments in the use of inoculation and lime in the culture of alfalfa are briefly summarized.

As already noted (E. S. R., 17, p. 648; 18, p. 820), the commercial cultures examined were found "worthless for practical purposes" and the results of inoculation of alfalfa seed were found to be entirely negative. On the other hand, the application of soil from an alfalfa field at the rate of 100 to 200 lbs. per acre almost invariably gave good results. Applications of lime or ashes at the rate of 1,500 lbs. of stone lime or its equivalent per acre were found to be beneficial.

Fixation of atmospheric nitrogen by pure cultures of Azotobacter.—**Distribution of the organism**, M. W. BEIJERINCK (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 11 (1908), pp. 67–74; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 553, II, pp. 975, 976*).—Contrary to the opinion formerly held by him, the author now finds, as a result of improved technique for the determination and study of the distribution of the organism, that Azotobacter fixes nitrogen, and that there is a distinct relation between the distribution of this organism and leguminous plants.

Investigations on the variation and the nitrogen fixing power of Bacillus asterosporus, G. BREDEMANN (*Centbl. Bakt. [etc.], 2. Abt., 22 (1908), No. 1–3, pp. 44–89, pls. 2, figs. 3*).—Studies made with 27 cultures of different origin are reported in detail. A bibliography of 24 references bearing upon the subject is also given.

The mineral nutrients of plants, P. VAGELER (*Die mineralischen Nährstoffe der Pflanze. Leipsic, 1908, pp. VI+130, figs. 3*).—This book, which gives a general survey of the subject, contains an introduction discussing briefly the general relation of animals and plants and chapters on the origin of the ash constituents of plants, the character of the ash constituents and their function in the plant organism, and the application of theories of plant nutrition in practice, that is, with reference to the function and use of mineral fertilizers.

Nature and use of commercial fertilizers, G. S. FRAPS (*Texas Sta. Bul. 112, pp. 5–35*).—This is a popular summary of information on this subject containing specific information as to the fertilizers required by cotton, corn, rice, potatoes, alfalfa, onions, peanuts, oats, and other crops.

The purchase and use of commercial fertilizers, R. MARÈS (*Bul. Agr. Algérie et Tunisie, 14 (1908), Nos. 20, pp. 485–502; 21, pp. 513–520*).—This subject is discussed primarily from the standpoint of Algerian and Tunisian conditions and crops. The legislation controlling the trade in fertilizers in these colonies is given.

Influence of the weather on the action of commercial fertilizers, W. VON SYCIANKO (*Fühling's Landw. Ztg., 57 (1908), No. 20, pp. 698–701*).—Reference is made to a previous article by Grohmann (E. S. R., 20, p. 311) which maintained that the results of many of the experiments heretofore made do not permit of reliable conclusions because no exact account was taken of the influence of weather conditions, and an attempt is made to show the direct relation between varying conditions of moisture and temperature and the action of fertilizers as demonstrated by observations on fertilizer experiments with strawberries, carrots, kohl-rabi, peas, and other vegetables in which the results were carefully correlated with the weather conditions.

The influence of precipitation on the efficiency of commercial fertilizers, GROHMANN (*Mitt. Landw. Inst. Leipzig, 1908, No. 9, pp. 1–76; abs. in Illus. Landw. Ztg., 28 (1908), No. 53, pp. 465, 466*).—This article is based upon obser-

vations on a number of farms in the region of Leipsic as to the effect of rainfall from the time of seeding to the time of blooming on the action of various fertilizers (nitrate of soda, potash salts, and superphosphate) on the growth of oats during the dry year of 1904. The rainfall during the growing period (38 days) of 1904 was 126.8 mm., or 118.2 mm. less than the normal for the region.

The broad general fact was brought out that the greater the rainfall during the growing period the smaller the action of the easily soluble and the greater the action of the difficultly soluble fertilizers. The distribution, as well as the amount of the rainfall, was of great importance. Difficultly soluble fertilizers gave best results when there were a few days of heavy rainfall rather than many days of light rainfall. Nitrate of soda was found to be effective as a fertilizer only when the average daily rainfall during the growing period was at least 2.5 mm. Potash salts and superphosphate required 3.5 mm. Since only about 40 per cent of rainfall is on the average used by plants, it is of great practical value to determine the limits of efficient rainfall for each locality. By application of the method of least squares the probable effect of the fertilizers under different rainfall conditions was calculated. These calculated results agreed quite well with those actually obtained in the field experiments.

Some results of the use of chemical fertilizers in Carnia, Z. Bonomi (*Ann. R. Staz. Sper. Agr. Udine, 9 (1908), pp. 27–30*).—A comparison on natural permanent meadow is here reported of mineral superphosphate alone and combined with nitrate of soda and with nitrate of soda and sulphate of potash. The superphosphate (12 to 14 per cent phosphoric acid) was used at the rate of 540 lbs. per acre, the nitrate of soda at the rate of 135 lbs. per acre, and the sulphate of potash at the rate of 180 lbs. per acre. Two plats were used for each combination and for check plats. The complete fertilizer gave the largest absolute gain, but the best result economically was obtained from the superphosphate and nitrate of soda.

Investigations on the composition of Peruvian guano, J. G. Maschhaupt (*Engrais, 23 (1908), No. 51, p. 1214*).—The results of 40 analyses of Peruvian guano are summarized, showing the variations in soluble potash, phosphoric acid, oxalic acid, uric acid, ammoniacal nitrogen, nitrogen in form of sulphate of ammonia, and total nitrogen in pure guano, leached and decomposed guano, and mixtures of guano and sulphate of ammonia. It is shown that the composition even of pure guano is so variable that it is impracticable to fix a standard for it.

Studies on the preparation of nitrate, J. Jörgensen (*Bol. Soc. Fomento Fabril [Chile], 25 (1908), No. 11, pp. 621–626*).—Studies of the solubility at different temperatures of caliche containing varying proportions of sodium nitrate, sulphate, and chlorid are reported. These caliches are divided into 3 general groups: (1) Those containing a large amount of sodium chlorid; (2) those containing a large amount of sodium sulphate; and (3) those containing carbonate (lei) in addition to chlorid and sulphate.

The first group presents no difficulties. For the second group the use of steam of low pressure is recommended. The preparation of the third group is complicated and not more than 50 per cent of the nitrate is usually recovered.

The author states that considerable nitrate is lost in the liquid remaining after the present processes of extraction are complete, and that much of this loss may be avoided by careful chemical analyses and improved methods.

Experiments on the action of nitrate of soda, ammonium salts, lime nitrogen, nitrogen lime, and the Norwegian lime niter, W. Schneidewind et al.

(*Arb. Deut. Landw. Gesell., 1908, No. 146, pp. 118; abs. in Mitt. Deut. Landw. Gesell., 23 (1908), No. 36, p. 300; Mark Lane Express, 99 (1908), No. 4021, p. 445; Chem. Ztg., 33 (1909), No. 18, Repert., p. 79*).—This report gives an account of laboratory, pot, and field experiments with these fertilizing materials during the years 1905 to 1907.

The laboratory experiments dealt with the study of losses of nitrogen when lime nitrogen was mixed with soil and with peat and other coarse materials, and when lime nitrogen and sulphate of ammonia were applied as top-dressing. The pot experiments were made in the ordinary way with oats, rye, and potatoes. In the field experiments the crops used were rye, wheat, barley, potatoes, and sugar beets.

Nitrate of soda in general produced the best results. Sulphate of ammonia was on the average about 90 per cent as effective as nitrate of soda in field experiments and 93 per cent as effective in pot experiments. In the field experiments ammonium sulphate was always used in combination with superphosphate in the belief that with such a combination there was no danger of loss of ammonia. The Norwegian basic lime nitrate gave practically the same results on most of the crops as nitrate of soda, although on wheat the latter was slightly superior. Calcium cyanamid did not give good results, especially with beets, on sandy and sandy loam soils. It gave good results except in case of beets on the better class of soils, although it did not prove equal to nitrate of soda. When used on wheat on good soil the efficiency of lime nitrogen was 80 per cent of that of nitrate of soda in field experiments and 85 per cent in pot experiments. Under the same conditions its efficiency was 92 per cent of that of ammonium salts in field experiments and 91 per cent in pot experiments.

In comparative tests of autumn and spring top-dressing nitrate of soda gave the best results when applied in the spring, but these were little better than those produced by fall application of sulphate of ammonia on good soils. On light soils, however, the results with spring application of nitrate of soda were much better than with fall application of sulphate of ammonia. The results indicate that on the light soils the sulphate of ammonia applied in the fall is converted into nitrates and lost from the soil during the winter. Late spring top-dressing with nitrate of soda reduced the sugar content of sugar beets.

The results indicate, therefore, that in general ammonium salts are not well suited to fall application, and suggest that lime nitrogen is probably better suited to this purpose.

The comparative fertilizing value of calcium cyanamid, calcium nitrate, ammonium sulphate, and sodium nitrate, V. Nazari (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 17 (1908), II, No. 7, pp. 334–342; abs. in Chem. Zentbl., 1908, II, No. 22, pp. 1785, 1786*).—This article gives the results of plat experiments with wheat on different kinds of soil to determine (1) the effect of humus on the action of cyanamid; (2) the best depth of application of cyanamid; (3) the effect of various phosphatic, potash, and calcareous fertilizers on the action of cyanamid; and (4) the comparative effect of cyanamid and the other nitrogenous fertilizers.

On sandy calcareous soils receiving applications of 4½, 13½, 27, and 45 tons per acre of stable manure spaded in to a depth of 10 in. 13 days before the planting of the crop the yields uniformly increased with the increase in the amount of manure added both when the manure was used with cyanamid (178 lbs. per acre) and without it. Cyanamid alone increased the yield of grain from 45 to 50 per cent.

The best results were obtained when the cyanamid was applied 10 days before the planting of the crop at a depth of 8 in., and the poorest at a depth of 2 in., on sandy calcareous and clayey calcareous soils.

The results of the experiments with various combinations of fertilizers were too complex for definite conclusions, but it was found that of the phosphates, including bone meal, mineral phosphate, and Thomas slag, the bone meal gave the best results, and of the potash fertilizers, including sulphate of potash, muriate of potash, and leucite, the sulphate and leucite were nearly equally efficient. Gypsum was less effective than lime. The greater efficiency of the bone meal is attributed to the fact that it furnished the most favorable conditions for the action of micro-organisms which render cyanamid available.

In the comparative tests of the different nitrogenous fertilizers on clayey calcareous soil applied in various ways the two nitrates gave very nearly the same result as sulphate of ammonia. In case of the latter the most favorable method of application was half at sowing and half as a top-dressing later. With the cyanamid, application shortly before sowing and thorough mixing with the soil gave best results.

Field experiments with lime nitrogen, sulphate of ammonia, and nitrate of soda, Tancré (*Landw. Wchnbl. Schles. Holst., 58 (1908), No. 51, pp. 870–873*).—Comparative tests of these fertilizers with rye, oats, barley, and beets are reported. The results in general were very favorable to the lime nitrogen, even in rainy seasons on heavy soils, the physical properties of which were injuriously affected by nitrate of soda.

Contribution to the ammonia question, I. P. Ehrenberg (*Landw. Vers. Stat., 69 (1908), No. 3–4, pp. 259–294, pl. 1; abs. in Chem. Ztg., 32 (1908), No. 93, Repert., p. 599; Chem. Zentbl., 1908, II, No. 24, p. 1893; Jour. Chem. Soc. [London], 94 (1908), No. 554, II, p. 1068; Chem. Abs., 3 (1909), No. 7, p. 817*).—This article reviews the work of other investigators on changes in the reaction of soils due to application of lime and nitrogenous fertilizers, and reports a series of pot experiments by the author in which white mustard, sorghum, buckwheat, corn, barley, and oats were grown in pure sand and in mixtures of sand and moor soil in small glass jars with various combinations of lime and other fertilizing materials furnishing physiologically acid or physiologically alkaline conditions in the soil.

The results were variable and did not in all cases confirm the conclusions of other investigators on this subject. It was apparent, however, that the difference in behavior in ammonium salts and nitrate combinations was due to difference in physiological reaction brought about by the use of these combinations. When nitrate was used the assimilation of the nitrogen set free the base, which tended to neutralize acid conditions in the soil and thus favored the growth of the crops. With ammonium salts the opposite effect was produced. Mustard and buckwheat are decidedly sensitive to acid conditions in the soil and were especially benefited by liming. Sorghum was less sensitive and less benefited by lime. Corn was the least sensitive of the crops experimented with.

The injurious effects of crude ammonia in vineyards, A. Berget (*Rev. Vit., 30 (1908), No. 768, pp. 257–259*).—Serious injury to grapes resulting from the use of 891 lbs. of this material per acre is reported, and 1,783 lbs. per acre should not be exceeded in any case.

Ammonium sulphate, F. J. Lloyd and U. Bonelli (*Chem. News, 98 (1908), No. 2549, pp. 172, 173; Chem. Trade Jour., 43 (1908), p. 362; abs. in Chem. Zentbl., 1908, II, No. 18, p. 1538; Analyst, 33 (1908), No. 393, p. 483*).—Attention is called to the fact that commercial ammonium sulphate may contain impurities (coal-tar derivatives) which unfit it for use as a fertilizer, since these impurities are injurious to higher plants and interfere with the action of the micro-organisms in the soil. The presence of these compounds is shown by a

violet coloration when strong ammonia is added to a solution of 1 gm. of the sample in 5 cc. of water.

The production of ammonium sulphate, C. G. ATWATER (*Amer. Fert., 29 (1908), No. 6, pp. 19–23*).—Statistics of production and consumption of sulphate of ammonia in this country and abroad are given. The total consumption in this country in 1907 is stated to have been 121,669 short tons, the imports 32,069 tons. The average price per ton was $61.93.

On the utilization of the atmospheric nitrogen in the production of calcium cyanamid, and its use in agriculture and chemistry, A. R. FRANK (*Trans. Faraday Soc., 4 (1908), No. 2, pp. 99–119, pls. 9, figs. 3*).—The more important facts contained in this paper have already been noted from another source (E. S. R., 20, p. 624).

The ammoniacal fermentation of cyanamid, C. ULPIANI (*Gaz. Chim. Ital., 38 (1908), II, No. 4, pp. 358–417; abs. in Chem. Zentbl., 1908, II, No. 19, pp. 1627, 1628; Jour. Soc. Chem. Indus., 27 (1908), No. 23, p. 1167*).—The author concludes from his investigations that contrary to the opinion of Löhnis, cyanimid is not ammonified by bacteria, but easily undergoes chemical change into dicyandiamid, urea, and other products. Dicyandiamid and urea are converted into ammonia, the first slowly, the second rapidly. Neither is injurious to vegetation, at least in amounts at which nitrogenous fertilizers are usually applied, and their formation completely destroys the poisonous properties of the cyanimid.

Experiments with calcium cyanamid, Z. BONOMI (*Ann. R. Staz. Sper. Agr. Udine, 9 (1908), pp. 31–41*).—Using natural permanent meadow which had been fertilized in December with 540 lbs. of Thomas slag and 180 lbs. of sulphate of potash per acre, three plats were in February given calcium cyanamid at the rate of 180 lbs. per acre and three sulphate of ammonia at the same rate. The results were in favor of calcium cyanamid. There were two tests of wheat, calcium cyanamid being compared in one with a mixture of sulphate of ammonia and nitrate of soda and in the other with sulphate of ammonia. The applications in each case were sufficient to give about 11 lbs. of nitrogen per acre. In both tests calcium cyanamid produced slightly larger results. With potatoes calcium cyanamid was compared with sulphate of ammonia, the fertilizers being applied as a top-dressing after being mixed with an equal amount of sand.

In a pot experiment with hemp, calcium cyanamid was compared with sulphate of ammonia; the latter was found to be inferior to the former. With corn calcium cyanamid was inferior to sulphate of ammonia in producing ears, but superior in the production of stalks. It was found that calcium cyanamid scorched the foliage of potatoes. This was due to the fact that the finely powdered fertilizer fell on the plant and adhered to it.

Lime nitrogen and its changes in the soil, E. DE KRUIJFF (*Teysmannia, 19 (1908), No. 6, pp. 357–362*).—The author briefly reviews the results of other investigations on this subject and reports experiments of his own on the rate of transformation of lime nitrogen into ammonia in culture solutions with and without glucose inoculated with 15 gm. of different kinds of soil, the object of which was to study the part played by soil bacteria in changing lime nitrogen into a form available for plant food.

The conclusions reached were as follows: (1) The change of lime nitrogen into forms suitable for plant life takes place only under the influence of microbic life. (2) The rapidity of these changes depends upon the composition of the soil. (3) The poisonous effect of lime nitrogen upon bacterial life, and in all probability, also upon plant growth, makes itself felt in a poor soil for a longer time than in a fertile soil. (4) Lime nitrogen, with good management, is equiva-

lent to nitrate of soda and sulphate of ammonia as an artificial fertilizer. (5) On some soils the use of lime nitrogen is not recommended.

Is it economically expedient to use potash fertilizers? Z. Bonomi (*Ann. R. Staz. Sper. Agr. Udine, 9 (1908), pp. 5–26*).—A report is given on tests of the effect of sulphate of potash on clover, medic, natural permanent meadow, and wheat and clover.

The amount of sulphate of potash used was 180 lbs. per acre on all the plats except one of clover and one of medic, which received 135 lbs. per acre, and one of clover, which received 225 lbs. per acre. Every plat showed an increased product. This increase was enough to give a profit over the cost of fertilizer in the first year on some of the plats of clover and medic, and on the wheat and clover. The second year showed enough increase to leave a profit except on one plat of natural permanent meadow, which was a special soil.

Raw rock phosphate (*Amer. Fert., 29 (1908), No. 2, pp. 5–9*).—This is a statement by the National Fertilizer Association summarizing conclusions reached from various experiments as to the relative efficiency of raw and dissolved phosphates. The general conclusion reached is that "the experience of the German experiment stations, combined with a majority in this country, show emphatically that raw rock phosphate has little or no fertilizing value, [and that] the method of applying followed by users of this material in this country is most extravagant and wasteful."

Statistics of the production of phosphates in 1908, Maizières (*Engrais, 23 (1908), No. 50, pp. 1189, 1190*).—Statistics are given of the production of American and Tunisian phosphates.

Withdrawal of western phosphate lands for protection of the industry (*Amer. Fert., 29 (1908), No. 6, pp. 12, 13; Tradesman, 60 (1909), No. 9, p. 458*).—This is a brief statement regarding the phosphate lands withdrawn from entry by the Secretary of the Interior in accordance with the President's order, in Morgan, Rich, and Cache counties, Utah; portions of Bear Lake, Bannock, Bingham, and Fremont counties, Idaho; and nearly all of Uinta County, Wyoming. The lands withdrawn were selected as a result of preliminary examinations by the U. S. Geological Survey, and comprise "in all about 7,500 square miles of land more or less underlain by phosphate rock and constituting the greatest known phosphate deposit of the world."

It is stated that 2,265,000 tons of phosphate rock was produced in the United States in 1907, of which 900,000 tons, or about 40 per cent, was exported. It is estimated that at the present rate of mining the known available supply of high-grade phosphate rock in the United States will last only 54 years, and if the increase in production shown during the last decade continues the supply will be exhausted in 25 years.

Florida phosphate deposits, E. H. Sellards (*Farmer and Fruit Grower, 43 (1908), Dec. 25, p. 1*).—The present state of development of these deposits is briefly reviewed in this article by the State geologist of Florida.

The phosphates of Tunis, Maizières (*Engrais, 23 (1908), No. 51, pp. 1213, 1214*).—This is a brief review of a recent report on the deposits of Djebel-Gouraya.

The manufacture of superphosphate, Grueber (*Die Superphosphatfabrikation. Halle, 1907, pp. 83; rev. in Osterr. Chem. Ztg., 11 (1908), No. 22, p. 307*).—One of a series of monographs on chemical-technical manufacturing methods.

A test of manganese as a fertilizer, Z. Bonomi (*Ann. R. Staz. Sper. Agr. Udine, 9 (1908), pp. 52–56*).—In an experiment with horse beans all the pots received Thomas slag supplying 56 lbs. soluble phosphoric acid per acre, sulphate of potash furnishing 66 lbs. oxid per acre, and nitrate of soda at the rate of 27 lbs. nitrogen per acre. In addition alternate pots received sulphate of

manganese at the rate of 65 lbs. per acre. The beans showed the action of the manganese to be quite favorable.

The fertilizing value of ashes. E. Pont (*Bul. Mens. Soc. Cent. Agr., Hort. et Acclim. Nice, 48 (1908), No. 11, pp. 348–353*).—This article briefly summarizes information regarding the composition and fertilizing value of leached and unleached wood ashes and coal ashes. The variation in the composition of the ashes of different kinds of wood, leaves, bark, tobacco, nut shells, and peat is also shown. The average composition of wood ashes is stated to be 6 to 7 per cent of potash and 3 to 5 per cent of phosphoric acid. It is stated that coal ashes may contain as high as 5 per cent of potash, but that the percentage is frequently much lower than this and that such ashes are always poor in phosphoric acid.

On the use of bracken as litter. E. J. Russell (*Jour. Bd. Agr. [London], 15 (1908), No. 7, pp. 481–487; abs. in Mark Lane Express, 99 (1908), No. 4025, p. 555*).—This article discusses briefly the suitability of bracken as bedding for animals and its fertilizing value, particularly as compared with straw. It is stated that bracken contains on the average 1.44 per cent of nitrogen, 0.2 per cent of phosphoric acid, and 0.11 per cent of potash, and is thus richer in fertilizing constituents, especially nitrogen, than wheat straw. It is a better absorbent than straw, but manure made with it decomposes less rapidly than straw-made manure.

A novel fertilizer industry. L. B. Judson (*Cornell Countryman, 6 (1908), No. 3, pp. 73–76, figs. 6*).—The machinery and methods employed at a place near Hackettstown, N. J., for preparing peaty soil for use as a fertilizer filler are described.

Fertilizer inspection. C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 160, pp. 275–310*).—This is a report in the usual form of results of analyses of fertilizers collected in the open market in the spring of 1908 by the station representative.

Analyses and valuations of commercial fertilizers and ground bone. C. S. Cathcart, V. J. Carberry, and C. L. Pfersch (*New Jersey Stas. Bul. 217, pp. 40*).—This bulletin supplements a previous bulletin on the same subject (E. S. R., 20, p. 625) and summarizes the complete data for fertilizer inspection during the year, which involved the examination of 735 samples of fertilizing materials.

Inspection of fertilizers. L. L. Van Slyke (*New York State Sta. Rpt. 1907, pt. 3, pp. 221–224*).—This is a historical review of fertilizer legislation in New York, including the main provisions of the present law and a brief summary of some of the direct results of fertilizer inspection.

Analyses of fertilizers, fall season, 1907, and spring season, 1908. B. W. Kilgore et al. (*Bul. N. C. Dept. Agr., 29 (1908), No. 7, pp. 76*).—The names and guaranteed composition of fertilizers registered for 1908, and analyses and valuations of about 560 samples of commercial fertilizers and 54 samples of cotton-seed meal, examined during the fall of 1907 and spring of 1908, are reported, with explanations regarding terms used in fertilizer analyses, freight rates, valuation, etc.

Complete report on commercial fertilizers for 1908. J. H. Stewart and B. H. Hite (*West Virginia Sta. Bul. 118, pp. 265–318*).—This report gives the results of examinations of 215 samples of fertilizers inspected during the year, with a discussion of the quality of the fertilizers sold in the State.

Fertilizer control laws. J. T. Welch (*Amer. Fert., 29 (1908), No. 6, pp. 7–10*).—This is a paper read before the Southern States Association of Commissioners of Agriculture and Other Agricultural Workers at Nashville in October, 1908, and discusses the basis for a general fertilizer law.

AGRICULTURAL BOTANY.

The heredity of acquired characters in plants, G. Henslow (*London, 1908, pp. XII+107, pls. 2*).—The object of this book is to prove that evolution, so far as plants are concerned, depends upon the inheritance of acquired characters. The author points out that Darwin supplemented his theory of the origin of species by means of natural selection by other interpretations of the methods of evolution. He considers that the present position of ecologists, in accepting the fact that evolution in plants is the result, not only of a natural response to the direct action of changed conditions of life by means of which they evolved new structures in adaptation to their new environments, but also of the heritability of these acquired characters is in exact accord with the alternative suggested by Darwin himself.

A laboratory course in plant physiology, W. F. Ganong (*New York, 1908, 2. ed., pp. VI+265, pls. 3, figs. 68*).—This edition of the laboratory guide has been rewritten and much extended from the first edition. The objects, as stated by the author, are to lead students through a good laboratory course in plant physiology, to provide a handbook of information upon all phases of plant physiology having an educational interest, and to serve as a guide to self-education by ambitious teachers or students who are unable to obtain regular instruction. The book is not designed as a compendium of physiological knowledge nor as a handbook of investigation, but rather as a guide to the acquisition of a physiological education.

An introduction to experimental plant morphology, K. Goebel (*Einleitung in die experimentelle Morphologie der Pflanzen. Leipsic and Berlin, 1908, pp. VIII+260, figs. 135*).—After discussing the general problems of experimental morphology, the author considers at length the influence of external and internal conditions on leaf formation, the conditions necessary for the formation of terminal and lateral axes, the regeneration of tissues, and the influence of polarity, etc., on plants, the book in its present form being an expansion of a course of lectures given by the author in 1906–7.

The absorption of rain and dew by the green parts of plants, G. Henslow (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 167–178*).—By a series of experiments with detached portions of various species of plants, the author is convinced that the power of absorption of water, either in the form of dew or rain, is possessed by the epidermis of the internodes of herbaceous plants and by attached and detached leaves. He claims that "there are ample reasons for believing that dew and rain are, when absorption has been deficient, absorbed and utilized to supplement the normal root supply."

Root development, N. O. Booth (*New York State Sta. Rpt. 1907, pt. 3, pp. 345–349*).—A summary is given of investigations carried on at the station, most of which have been printed in the earlier reports, showing the distribution of roots in vertical and horizontal directions in the soil, the variation of root distribution due to cultivation, etc.

Some chemical processes in the germination of seed, F. Scurti and A. Parrozzani (*Gaz. Chim. Ital., 38 (1908), I, No. 2, pp. 216–227*).—The authors describe some of the chemical changes which take place during the germination of sunflower seed, and the action of light and darkness upon the changes noted. The experiments were conducted principally to determine the transformation of proteid nitrogen.

The transformation of cyanogenetic glucosids during germination, L. Guignard (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 22, pp. 1023–1028*).—In order to determine the question of the transformation of cyanoge-

netic glucosids during germination, a study was made of the seeds of *Phaseolus lunatus*, in which seeds and seedlings were examined at regular intervals.

It was found that the total amount of glucosid in the seed diminished, fully ⅓ of it being used up during germination and growth of the seedlings for 30 days in the dark. In the seedlings ⅔ of the phaseolunatin was found within 15 days after germination. In the seedlings kept in the light the loss of the glucosid began to be restored in about 10 days through the synthesis of hydrocyanic acid under the action of chlorophyll, and this formation increased with the development of the leaves.

The question of the occurrence of free hydrocyanic acid in the seed was investigated, and the author states that if any free hydrocyanic acid is formed during germination through the action of the glucosid it immediately disappears to form other combinations.

Notes on plants containing hydrocyanic acid, E. Couperot (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 12, p. 542*).—A list is given of 14 species of plants which the author has found to contain hydrocyanic acid, 8 of them being grasses. These species are in addition to those formerly reported by different authors.

On the action of some organic substances on plants, G. Ciamician and C. Ravenna (*Gaz. Chim. Ital., 38 (1908), I, No. 6, pp. 682–697*).—The authors describe experiments made with a view to studying the formation and biological significance of glucosids in plants. In cultures containing various aromatic compounds and glucosids, corn and beans were grown to ascertain how these substances would react upon the plants. Among the aromatic compounds used were benzoic aldehyde, salicylic aldehyde, hydrochinon, methyl salicylate, benzilic alcohol, and vanillin. The glucosids used were amygdalin, salicin, and arbutin.

The results show that the plants tolerated the glucosids much better than the aromatic substances. In some of the experiments with corn the glucosids were partially broken down and seemed to be utilized by the plants, as only a fraction of the original substance could be recovered after the experiment was concluded. In the case of amgydalin less than 0.1 was reclaimed at the end of the experiment.

The authors state that glucosids in the plant are to be considered as reserve materials, and in this form poisonous substances can accumulate that in the free state would not be tolerated by the plant.

The effect of alkaloids on regeneration in the scarlet runner bean, S. Morgulis (*Ohio Nat., 9 (1908), No. 2, pp. 404–412, figs. 5*).—Experiments are described in which the effect of the sulphates of atropin and strychnin, pilocarpine hydrochlorid, and digitalin on the regeneration of scarlet runner beans was studied. The seeds of the beans were germinated in sawdust, and the seedlings transferred to jars covered with black paper, in order to protect the roots from sunlight.

The plants were subjected to different strengths of the alkaloids, and after an interval of 2 days in the solutions were cut off just above the cotyledons and the rate and amount of growth, transpiration, etc., determined. The transpiration and fresh and dry weight of the plants are shown in tables. Seventeen days after the first mutilation of the plants, the stems were cut a second time near their ends, and the same factors of growth again determined.

It was found that the alkaloids exert a stimulating influence upon regenerating plants, increasing the rate of their regeneration. Comparisons were made with the effect of alkaloids on sea-urchin eggs, and with the single exception of the stronger solution of strychnin the beans were found able to live in concentrations which would prove fatal to animals.

The action of the alkaloids upon plants varies with the nature and strength of the solution, but on the whole there is a general rise and intensification of the vital processes, as seen in the increased transpiration and higher rate of regeneration. The rate of regeneration after consecutive operations shows that after the second operation there is a considerable decrease in the power of regeneration and, consequently, a slowing down of the process, as well as a lengthening of the period intervening between the operation and the first appearance of regenerated tissue.

Studies on solanin from sprouts and flowers of the potato, A. Colombano (*Gaz. Chim. Ital., 38 (1908), I, No. 1, pp. 19–37*).—A study is reported on the solanin occurring in the sprouts and flowers of the potato. The methods of isolation and characteristics of the alkaloid are described, and comparisons drawn between solanin obtained from the cultivated potato (*Solanum tuberosum*) and that isolated from *S. sodomæum*.

The influence of aluminum salts on protoplasm, M. Fluri (*Flora, 99 (1908), No. 2, pp. 81–126*).—Experiments with Spirogyra, Elodea, and Lemna in cultures containing sulphate, nitrate, chlorate, and bichromate of aluminum, yttrium nitrate, and lanthanium nitrate are described, which showed that there was a marked reduction of starch in plants grown in the light. While these substances in nearly every instance checked assimilation, the assimilatory processes were not wholly inhibited. These chemical compounds seemed to exercise a kind of plasmolysis on the protoplasm without any considerable contraction.

The action is not believed to be a chemical one, as the amount of the compounds present in the cells was very small. The aluminum salts apparently act upon the diastases, which will account in some degree for the reduction of starch.

If grape sugar, glycerin, or isodulcite is added to cultures containing aluminum compounds the injurious action of the chemical is inhibited.

Effects of the rays of radium on plants, C. S. Gager (*Mem. N. Y. Bot. Gard., 4 (1908), pp. VIII+278, pls. 14, figs. 73*).—After describing the discovery and nature of radioactivity, a review is given of previous investigations on plants and animals. From these investigations the conclusions are drawn that radium rays and Roentgen rays modify the life processes of plants and animals, the sensitiveness varying with the different species of plants and animals as well as with the strength of the rays. The younger and especially the embryonic tissues are more sensitive to the rays than the mature tissues, and with few exceptions cell activities are retarded or completely inhibited. The evidence for and against radiotropic response is conflicting, and internal changes appear profoundly modified by the presence of chlorophyll in the cell. The activity of enzyms is retarded by radium rays.

The author carried on extensive experiments with a number of species of plants to determine the effect of radium rays on the growth of seeds, on germination, synthesis of carbohydrates, respiration, alcoholic fermentation, tropistic response, histology, nuclear division, etc. The exposure to radium rays of lupine and buckwheat seeds previously soaked in water resulted in a retardation of growth, but an initial retardation of growth of white mustard was followed by acceleration. The effect of exposure to radium rays varied with the duration of exposure and the degree of activity of the radium. The effect of radium acting through the soil was to accelerate germination and subsequent growth of unsoaked oats in proportion to the distance from the radium, those plants farthest away being stimulated the most. The growth of lupine shoots under like conditions was retarded, although the root growth was 2 to 3 times as long as normal. Soaking seeds in water exposed to

radium had in general a stimulating effect on growth. Thorium rays from a Welsbach burner had practically the same effect as radium rays. The exposure of leaves to radium tubes resulted in a retardation of starch formation immediately under the radium coated rods. Anaerobic respiration was retarded and normal aerobic respiration accelerated by radium rays. Alcoholic fermentation was accelerated when radium tubes were placed in fermenting mixtures, and the budding of yeast cells was considerably increased.

In experiments on tropistic response the author found that neither roots nor shoots growing in air showed the slightest tendency to curvature to or from sealed tubes containing radium of various activities.

Where exposure to radium rays was followed by retardation of growth, histological examination showed a cessation of cell division, an acceleration of tissue differentiation, a decrease in the size of cells, and a lack of coordination in histogenesis.

Experiments with radioactive air indicated that radium acts as a stimulus to protoplasm. Where retardation of growth is observed, it is believed to be an expression of overstimulation. Acceleration of growth is held to indicate a stimulation between the minimum and optimum.

An extensive bibliography is included in this report.

Influencing the growth of plants by electricity, M. Breslauer and C. Schimidt (*Mitt. Deut. Landw. Gesell., 23 (1908), No. 50, pp. 441–445, figs. 3; Umschau, 13 (1909), No. 2, pp. 23–30, figs. 9; Deut. Landw. Presse, 35 (1908), No. 90, pp. 943, 944; abs. in Mark Lane Express, 99 (1908), No. 4031, p. 731; Chem. Abs., 3 (1909), No. 6, pp. 684, 685*).—These articles discuss experiments by Lemström and Lodge (E. S. R., 20, p. 630) and by one of the authors, Breslauer, of the Technical High School of Charlottenburg. They describe an installation similar to that of Lodge's, which was set up on a farm near Berlin with the object of testing the practical character of the method. It is estimated that the necessary apparatus may be installed and operated for about $21 per acre annually.

On wind injury to plants, F. Noll (*Sitzber. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, 1907, No. 2, Sect. A, pp. 58–68, fig. 1*).—A preliminary account is given of some experimental investigations on the effect of prevailing winds on plants.

The formation of red wood in conifers, Jean White (*Proc. Roy. Soc. Victoria, n. ser., 20 (1907), No. 2, pp. 107–124*).—A study was made of a number of species of Australian and other conifers to determine the cause of the formation of red wood, which is sometimes conspicuous in parts of the trunks of these trees. It has been previously suggested that the formation of red wood is due to a morphogenic response to a gravitational stimulus, and the experiments described were conducted with plants so rotated on a klinostat as to remove the action of gravity.

So far as the author's investigations go, they seem to confirm the theory that the formation of red wood is due to the stimulus of gravity. Where the lesser thickness shown by the walls of the red wood tracheids was compared with similar tissues in the white wood, the stimulus seemed to be photomorphic, the response being somewhat similar to etiolation in character.

The distribution and occurrence of races of mistletoe in Bavaria, K. von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 12, pp. 561–599, figs. 28, map 1*).—A study was made on the occurrence and distribution of mistletoe (*Viscum album*) in Bavaria. The author claims that there are 3 biological races of this species, one occurring on the pine, a second on firs, and a third on deciduous trees. Among the latter species, much injury is done to the apple, poplar, willow, and maple.

In combating the mistletoe, consideration must be given to the fact that there are biological races of the parasite and attention paid to the trees liable to infection by the particular form present.

FIELD CROPS.

Agricultural experiments, R. Ward, S. H. Bayley, and W. R. Dunstan (*Rpt. Bot. Gard. and Onderneem. School Farm Brit. Guiana, 1906–7, pp. 1–13*).—In fertilizer experiments with sugar cane it was found that the substitution of nitrate of soda for sulphate of ammonia on unlimed land continuously manured with sulphate of ammonia reduced the increased yield from 12.1 tons to 10.3 tons per acre, while the substitution of sulphate of ammonia for nitrate of soda on the nitrate fields produced an increase from 8.6 tons to 9.2 tons. The apparent ill effects of the long-continued use of nitrogenous fertilizers were far more noticeable after nitrate of soda than after sulphate of ammonia. On the lighter lands manured continuously for 30 to 50 years with sulphate of ammonia the decreases in yield are considered as probably due to the action of this substance. This injurious effect is remedied by the use of lime and not by simply substituting nitrate of soda for the sulphate of ammonia.

The results of these experiments have also led to the conclusion that if heavy clay soil yields more than 0.008 per cent of phosphoric acid to 1 per cent citric acid solution under conditions of continuous shaking for 5 hours, it is probable that manuring with phosphates on that particular soil will not produce commensurately increased yields of sugar cane. Work with different varieties has shown that B. 208 is unsuitable for very heavy clay soils, although in all the tests on the experiment fields this variety has been characterized by a high sugar content and a high purity.

The results of fertilizer experiments with rice show that in 100 tests with and without applications of phosphates 63 were in favor of the use of phosphates. Basic superphosphate gave increased yields in 69 cases, superphosphate in 64, and slag phosphate in 52. Assuming that the plats were of equal fertility increases of 4.7, 7.3, and 9.6 per cent were due to the use of superphosphate, slag phosphates, and basic superphosphate, respectively.

A large number of varieties of cotton were tested and the results are briefly described. Brief notes on the quality of each variety are given, and it is stated that all the varieties of cotton submitted for examination can be most successfully cultivated in British Guiana.

Work with field crops, F. H. Hall (*New York State Sta. Rpt. 1907, pt. 3, pp. 267–291*).—A summary is here given of the work conducted with field crops at the station during the first 25 years of its existence. The crops entering into this work were alfalfa, barley, corn, oats, onions, potatoes, sugar beets, tobacco, wheat, and forage crops.

Report on field trials on the manuring of seeds hay, J. F. Blackshaw (*Midland Agr. and Dairy Col. Bul. 1, 1907–8, pp. 11*).—Fertilizer experiments with rye grass and clover are reported.

The results indicate that the use of commercial fertilizers in a favorable season and on good ground may be profitable and that it is better to apply a complete dressing than an incomplete one. Unit for unit, the nitrogen in sulphate of ammonia and nitrate of soda was of equal value to the crop. Muriate of potash was the only form of potash giving a profitable return, and then only when applied during the earlier part of March. The results indicate that 130 lbs. of sulphate of ammonia and 216 lbs. of superphosphate applied during the earlier part of April, and 105 lbs. of muriate of potash applied during the earlier part of March is likely to give the most profitable yields of the different fertilizer applications compared.

Dates of seeding winter grains, T. B. Hutcheson (*Virginia Sta. Circ. 3, pp. 8, figs. 2*).—Brief notes are given on work previously reported (E. S. R., 18, p. 927).

Report on a field trial with varieties of barley (*Midland Agr. and Dairy Col. Bul. 2, 1907–8, pp. 15–22*).—The trials here reported indicate that Chevalier varieties produce the heaviest yield of grain, but that on some soils and in unfavorable seasons the quality is not of the best. In general, barleys of the Goldthorpe type produce better grain than the Chevalier barleys.

The blue grass of southwest Virginia, W. B. Ellett (*Virginia Sta. Bul. 180, pp. 90–96*).—A chemical study of blue grass in the southwestern part of Virginia as compared with other localities is reported, with reference to the claim that the grass in this region is superior to any similar grass grown elsewhere for finishing cattle without grain for export trade.

The blue grass and the blue-grass hay from southwest Virginia averaged 15.85 per cent in protein content, samples from the Valley of Virginia 12.67, and those from eastern Virginia 13.42 per cent. The green grass from the southwest averaged 17.82 per cent, from the Valley 15.10 per cent, and from eastern Virginia 16.15 per cent of protein. The average of samples of hay from 7 other States was 11.54 per cent of protein as compared with 12.67 per cent for Virginia and 14.53 per cent for southwest Virginia. Samples of grass from New York, Pennsylvania, and Wisconsin averaged 16.54 per cent as compared with 16.36 per cent from Virginia and 17.82 per cent from southwest Virginia. The young grass from all parts of the State averaged 16.36 per cent of protein, while grass ready to cut averaged 12.67 per cent. Samples of grass taken from a grazed meadow at Blacksburg on different dates contained the following percentages of protein on a dry matter basis: May 26, 16.92; July 6, 17.09; July 13, 20.86; July 20, 20.27; August 3, 18.09; August 17, 14.95; August 24, 14.87; September 4, 17.93; and October 19, 17.45.

Selecting seed corn, L. Carrier (*Virginia Sta. Circ. 4, pp. 2–12, figs. 3*).—This circular contains brief directions with reference to time to select seed corn, the kind of plant and ear to select, and the care of seed corn after harvesting.

Cotton culture in Palembang, W. M. Gutteling (*Jaarb. Dept. Land. Nederland. Indië, 1907, pp. 170–178*).—A brief description of experimental work with cotton is given and brief notes on the culture of several tree cotton varieties are presented. The results with Caravonica cotton led to the conclusion that the climate is too wet and changeable for this variety. Rough Peruvian (*Gossypium peruvianum*) and Brazilian cotton (*G. brasiliense*) produced no seed. Bourbon cotton (*G. purpurascens*) and *G. mexicanum* were also cultivated, and their behavior during the season is described in detail.

Supply and distribution of cotton for the year ending August 31, 1908, D. C. Roper (*Bur. of the Census [U. S.] Bul. 97, pp. 40, pls. 2, dgms. 3*).—The total supply of cotton in the United States for this year is given as 13,358,707 running bales. The cotton consumed by manufacturers amounted to 4,539,090 bales, of which 2,187,096 bales were used in the cotton-growing States and 2,351,994 bales in all other States. The exports reached 7,573,349 bales.

The different topics treated in the bulletin are supply and distribution, different cotton stocks in the United States, the world's consumption of cotton, the trade in cotton and its manufactures for selected countries, the history and description of cotton manufacture, utilization of cotton mill waste, water power, future dealings in the staple, and the grading and classification of the fiber.

Report on field trials on the manuring of mangels, J. F. Blackshaw (*Midland Agr. and Dairy Col. Bul. 8, 1907–8, pp. 79–96*).—Experiments conducted in 1907 show that it did not pay to use more than 90 lbs. of phosphoric

acid, nor more than 60 lbs. of potash, per acre for mangels. Both phosphate and potash were better applied shortly before seeding rather than in March. It is recommended that 100 lbs. of sulphate of ammonia, 715 lbs. of superphosphate, and 127 lbs. of sulphate of potash be applied at seeding time, 130 lbs. of nitrate of soda when the crop is thinned, and 280 lbs. of common salt in March.

[Variety tests with oats], L. A. Moorhouse (*Oklahoma Sta. Rpt. 1908, pp. 44, 45, 75, 76*).—Four varieties of oats were tested in 1905 and 1906. The average yields per acre were as follows: Texas Red 42.35 bu., Kherson 41.37 bu., Lincoln 38.67 bu., and Culberson 33.54 bu. In 1906 imported Iowa seed oats gave a yield of 23.19 bu. per acre.

Culture tests with Panicum maximum and Paspalum dilatatum in Dutch East India (*Jaarb. Dept. Landb. Nederland. Indië, 1907, pp. 86, 87*).—Planting *Panicum maximum* at different distances resulted in the best yields where plants were placed 90 by 50 cm. (about 36 by 20 in.) apart. As this plant comes into bloom about every 2 months, cutting every 2 months instead of every month is recommended.

Paspalum dilatatum in field culture gave poor results, but where sown in beds and later transplanted satisfactory yields were secured. This grass, which is a good meadow plant when sown thickly, is ranked next in value to *Panicum maximum*.

Report on field trials with potatoes: English, Scotch, and Irish seed, J. F. Blackshaw (*Midland Agr. and Dairy Col. Bul. 3, 1907–8, pp. 23–25*).—Seed of Up-To-Date and British Queen were obtained from England, Scotland, and Ireland, and in practically every case the Irish seed gave the best results.

Report on field trials on the manuring of potatoes, T. Milburn (*Midland Agr. and Dairy Col. Bul. 5, 1907–8, pp. 43–50*).—Moderately heavy dressings of farmyard manure up to 20 tons per acre proved profitable. Commercial fertilizers alone also gave good profit when applied in moderately large dressings, but not so good as when given together with the barnyard manure. Sulphate of ammonia proved a better source of nitrogen for potatoes than nitrate of soda, and superphosphate a better source of phosphoric acid than dissolved bone. Sulphate of potash, according to the author, has a more beneficial effect upon the potato crop than either muriate of potash or kainit. Superphosphate at the rate of 4 cwt. proved more profitable than either 2 or 6 cwt. The most profitable application used with barnyard manure consisted of 1½ cwt. of sulphate of ammonia, 4 cwt. of superphosphate, and 1 to 1½ cwt. of sulphate of potash per acre.

The "spineless" prickly pears, D. Griffiths (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 140, pp. 24, pl. 1, map 1*).—This bulletin discusses the origin of spineless prickly pears, their habitat, and their characteristics, and gives directions for the treatment of cuttings, planting, cultivation, harvesting, and uses of the plant. Notes are given on the temperature and moisture requirements, and the necessity of investigations to increase hardiness is discussed. The nature and origin of the prickly pears to be distributed by this Department are briefly outlined.

Experiments made by the author in different seasons and in different regions have shown that under open-air conditions in the arid and semiarid States no wilting of the joints is necessary before planting the cuttings.

Tests of sorghums, W. P. Wheeler (*New York State Sta. Rpt. 1907, pt. 3, pp. 229, 230*).—This article is a brief review of the work done with sorghums at the station during the first 25 years of its existence.

In 1888 sorghums were grown from 162 samples of seed, including about 100 distinct varieties. This work was carried on for several years. It was found

that most of the best sugar-producing varieties came from South Africa and a few from India. After 5 years' test only 6 of the varieties were recommended as reliable sirup producers for the latitude of the station. But seldom was less than 12 per cent of total sugars in the juice found in the mature cane of any of the better varieties. The use of carbonate of lime as a fertilizer did not definitely show any differences in quality, yield, and maturity.

Report on experiments on the growing of sugar beets, T. Milburn, J. Golding, and S. G. Paine (*Midland Agr. and Dairy Col. Bul. 9, 1907–8, pp. 99–109*).—The results of sugar-beet trials conducted in 1907 indicate that with regard to distance between rows it is advisable to adopt the narrowest width possible down to 12 in. It is further shown that in a damp and cold season digging should be delayed as long as possible, for in every case roots dug in November contained a higher percentage of sugar than those dug in October.

Sugar beets in 1908, W. B. Ellett (*Virginia Sta. Circ. 5, pp. 11*).—Brief reports on the sugar content and purity secured in cooperative culture tests in different counties of the State are given. Of the samples analyzed the richest contained 16.4 per cent of sugar in the beet, with a purity of 90.4 per cent. The highest purity coefficient recorded is 92.7 per cent.

The composition and production of sugar beets (*New York State Sta. Rpt. 1907, pt. 3, pp. 230–232*).—A summary of experiments with Kleinwanzleben and Vilmorin Improved sugar beets conducted from 1897 to 1901. In 1897, about 140 samples of beets from different parts of the State varied from 12 to 18.5 per cent in sugar content, the general average being about 15.3 per cent. The next year beets from 16 different localities contained from 10.1 to 18.5 per cent of sugar, with an average of 15.5 per cent. In 1899, 1900, and 1901 the sugar content in beets grown at the station varied from 12.3 to 18.5 per cent, with an average of 15 per cent. In the several years of work the coefficient of purity varied from 72.5 to 90.2, averaging about 83 per cent.

Additional details as to these cultural tests and also of fertilizer trials have been previously noted (E. S. R., 11, p. 238; 13, p. 1042).

Potash consumption of the beet during its first season of growth, K. Andrlík and J. Urban (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 10, pp. 559–575*).—In the series of experiments conducted with reference to this problem it was found that the quantity of potash taken up by the sugar beet in its first year of growth varies with the season, the soil, the fertilization, and the seed. The minimum quantity determined was 156.9 kg. in 400 quintals of beets (about 7.84 lbs. per ton of beets), but the consumption in general was much greater. The use of potash salts and barnyard manure increased the quantity of potash taken up, while dry seasons apparently reduced it, but the dry years also produced small yields of beets and sugar.

It was also observed that beets from different kinds of seed, grown under identical conditions, varied in potash consumption, and that beets from the same kind of seed but grown under different conditions also varied in this regard. A high potash consumption did not indicate a high yield of beets or of sugar, but was rather correlated with a heavy yield of leaves. The proportion of potash taken up to the quantity of sugar produced was not constant, the range determined being from 2.1 to 5.8 parts of potash to 100 parts of sugar. The roots contained from 32.1 to 41.5 per cent of the potash consumed, showing that the larger portion goes to the leaves. However, when the plants used large quantities of potash an increase in the potash content of the roots also took place.

In the beets showing the minimum content of potash the proportion of potash to sugar was 0.75 to 100, while in the beets containing on the average 177.5 kg. of potash per 400 quintals, the proportion of potash rose to 1.01 parts, and in the beets containing 303 kg. of potash per 400 quintals, to 1.72 parts per 100

parts of sugar. Some varieties of seed produced more potash and others less in the root. The differences observed ranged from 0.2 to 0.7 parts of potash per 100 parts of sugar.

Experiments with seedling and other varieties of canes, J. P. D'Albuquerque and J. R. Bovell (*Rpt. Agr. Work Barbados, Imp. Dept. Agr. West Indies, 1905–1907, pl. 3, pp. 99*).—This publication is the customary tabulated report, with brief comments, on this work carried on under the direction of the Imperial Department of Agriculture for the West Indies. The period covered is for the season between 1905 and 1907. The experiments were conducted in the same manner as previously noted (E. S. R., 19, p. 333).

On the black soils cane B. 3696 ranked first, with a yield of 2,045 lbs. of saccharose per acre in excess of that secured from White Transparent, the standard cane. B. 208 ranked second and B. 147 third, with increased yields of 1,494 lbs. and 922 lbs. of saccharose, respectively, over White Transparent. On the red soils, as plants and rattoons, B. 1566 stood first with 8,394 lbs. of saccharose per acre as plants and 6,645 lbs. as rattoons, while White Transparent as plant canes gave only 6,006 lbs. and as rattoons only 5,736 lbs. per acre. The average results from the best varieties during the past 4 seasons indicate that B. 3696, B. 1753, B. 1529, B. 147, and B. 208 are apparently the best varieties for the black soils, and B. 3405, B. 3412, B. 3390, B. 1566, B. 208, B. 1529, and B. 376 for the red soils. The seedling canes originated, selected, and tested in these experiments show a marked superiority in many instances. On the black soils the average results for 3 and 4 years, arranged according to saccharose yield, show that White Transparent stood last in a list of 90 with 6,670 lbs. of saccharose, while the seven best varieties gave an average of over 9,000 lbs.

[Variety tests with sweet potatoes], O. M. Morris (*Oklahoma Sta. Rpt. 1908, pp. 12, 13*).—The following varieties of sweet potatoes, with the yields per acre reported, were grown on thin upland soil of poor quality with a hardpan subsoil: Black Spanish 6,795 lbs., Blooming 5,094 lbs., Early Golden 17,771 lbs., Extra Early Carolina 9,460 lbs., Hanover Yam 11,585 lbs., Red Bermuda 15,309 lbs., Red Nancemond 4,807 lbs., Red Nose 9,889 lbs., Southern Queen 6,143 lbs., Vineless 981 lbs., Vineless Pumpkin Yam 10,371 lbs., Yellow Jersey 6,328 lbs.

Tobacco experiments, H. Jensen (*Jaarb. Dept. Landb. Nederland. Indië, 1907, pp. 199–247, pls. 3, dgm. 1*).—The results of experiments here described indicate that rubber solutions can not be used for combating phytophthora. In a plant breeding test it was found that the chances of securing a fixed broad leaf variety from an individual plant showing this characteristic were very small. It is believed that the plant with which the test was begun was a cross between a narrow and a broad leaf plant, and that for this reason the progeny broke up into many forms. A cross between Canary and Deli tobacco produced good plants practically free from mosaic disease, although the mother plants had been so attacked by this disease that they had improperly developed and were almost dwarfed.

Reciprocal crosses between White Burley and Peru followed Mendel's law in part only. Some of the individuals showed characters intermediate between the male and female parent in the first generation. The veins of the pure White Burley plants were light in color, which is regarded as a recessive character, while the veins of the crosses with Peru and Canary were normally green. With reference to the base of the leaf and the size of the plants the crosses were intermediate. The leaves in the hybrids had long stems, which is a character prevailing in Peru tobacco, and is therefore looked upon by the author as probably a dominant character derived from that variety.

After growing tobacco continuously for 5 years on the same soil green manuring gave good results, thus showing that fertility had declined. *Crotalaria retusa* as a green-manuring crop produced a good growth early enough in the season to be plowed under at the proper time. Irrigation increased the leaf surface of plants about 100 per cent.

The relation of nicotine to the quality of tobacco, W. W. Garner (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 141, pt. 1, pp. 16*).—The variation in the nicotine content and its relation to the quality of tobacco are discussed, and the results of experiments reported.

Extraction with petroleum ether of a sample of domestic filler tobacco possessing a peculiar pungency or harshness was found to remove the objectionable qualities. The ether extract, however, contained only a portion of the nicotine in the tobacco. The nicotine was apparently present in at least two forms, one of which is soluble in petroleum ether while the other is practically insoluble.

The total nicotine present in a sample of Connecticut wrapper-leaf tobacco before fermentation was 3.39 per cent and after fermentation 2.89 per cent, representing a loss of 0.5 per cent in the fermentation process. The nicotine soluble in petroleum ether before fermentation was 1.60 per cent, while that soluble after fermentation was 1.01 per cent. The loss of total nicotine in fermentation therefore corresponds very closely to the difference between the amount soluble in petroleum ether before and after fermentation.

The author concludes that "the undesirable sharpness or pungency contained in the smoke from certain types of cigar-filler tobacco and which constitutes one of the two factors included in the term 'strength,' as applied to the smoke, is due almost entirely to the volatile, easily soluble form of nicotine which acts as if it were in the free state. On the other hand, the true physiological effects of the smoke, as embodied in the term 'fullness,' are proportional to the total quantity of nicotine."

It was found that "the pungent, harsh quality of the smoke is partially, but not entirely, removed by protracted resweating and aging of the tobacco, whereby the easily volatile nicotine is largely expelled. This undesirable property is entirely removed by extracting the tobacco with petroleum ether, which simply dissolves out the volatile nicotine. Finally, the addition of sufficient citric acid to the tobacco to combine with all of this easily volatile nicotine efficiently overcomes the sharpness or pungency of the smoke."

Alaska wheat investigation, H. T. French and J. S. Jones (*Idaho Sta. Bul. 65, pp. 3–12*).—A classification of this wheat is given, the claims made for it are reviewed, and tests made at the station are reported.

Analyses made of the grain and the flour of Little Club and Alaska spring and Alaska winter wheat showed that in total protein and protein in the form of gliadin the Alaska wheat flour in both cases was somewhat higher than that from Little Club, which is described as a soft wheat, ranking probably about halfway between the best and the poorest milling varieties. The gluten in the Alaska spring wheat flour was rather hard to wash out, but when once obtained it seemed to be of practically the same quality as that secured from either of the other flours although somewhat less in amount. The water required to make a dough out of 340 gm. of flour for the different wheats was as follows: Little Club 180 cc., Alaska spring 182 cc., and Alaska winter 182 cc.

In baking tests both Alaska wheats gave noticeably whiter bread than did the Little Club. It was concluded from these tests that the gluten in the Little Club flour is somewhat stronger and quicker acting than that of the Alaska flours, but on the whole there was very little difference in the baking qualities of the flour obtained from the different wheats. The yield of Alaska wheat grown in

the vicinity of the station under field conditions is estimated at from 20 to 40 bu. per acre.

Seed studies (*New York State Sta. Rpt. 1907, pt. 3, pp. 330–344*).—This article is a review of the seed work of the station during the first 25 years of its existence. A description of the Geneva germinator is given, and the results secured in germination tests with field and garden seeds are tabulated, and the conclusions drawn from the investigation are pointed out.

The adulteration and misbranding of the seeds of alfalfa, red clover, orchard grass, and Kentucky blue grass, B. T. Galloway (*U. S. Dept. Agr., Office Sec. Circ. 28, pp. 5; Bur. Statis. Crop Reporter, 11 (1909), No. 3, pp. 21, 22*).—The number of seed samples secured and analyzed was 1,471 and analyses of the 102 samples which were found to be adulterated or misbranded are here reported. Of the 358 samples of alfalfa seed secured 86 contained seed of sweet clover, 76 seed of yellow trefoil, and in 107 dodder was present, ranging from a trace to a sufficient quantity to sow 3,600 seeds per square rod when seeding at the rate of 16 lbs. per acre. Only 8 samples contained yellow trefoil seed in sufficient quantity to be considered an adulterant.

Of the 413 samples of red clover secured only 2 were adulterated with yellow trefoil seed, though a trace of this seed was present in 164 samples. Dodder was found in 223 samples, and it was found that in seeding one lot at the rate of 8 lbs. of red clover seed per acre 679 dodder seeds would be sown per square rod. By the use of other lots more than 3,500 buckhorn and plantain seeds and 2,600 green foxtail seeds would be sown per square rod.

Of the 343 samples secured as orchard grass seed 2 contained no orchard grass seed, 2 were adulterated with chess, and 49 with seed of rye grass, meadow fescue, or both. Of the 357 samples obtained as Kentucky blue grass seed 25 contained Canada blue grass as an adulterant, 12 were practically all Canada blue grass, and 2 were meadow fescue.

It is stated that since this line of work reported here has begun, the importation of yellow trefoil seed and its use as an adulterant of red clover and alfalfa seed has practically ceased. Adulteration of orchard grass and Kentucky blue grass seed is also much less common now than a few years ago.

Feeds, seeds and weeds, E. H. Jenkins (*Connecticut State Sta. Bul. 161, pp. 3–6*).—This bulletin reports in tabular form, with brief discussion, the number and the vitality of weed seeds found in a pound of different proprietary feeding stuffs on sale in the State. The total number of weed seeds per pound in the 7 feeds examined ranged from 5,234 to 86,000. The seeds of Chætochloa, Chenopodium, Polygonum, Brassica, Ambrosia, Panicum, Rumex, and Silene were found in most of them. The number of Chenopodium seeds found in the feeds capable of germinating ranged from 27 to 13,814. The number of germinable Polygonum seeds was 453 in one feed and 522 in another, while from four samples none of these seeds grew. The vitality tests of the Chætochloa seeds showed that the number capable of germinating ranged from 0 to 13,118 per pound of feed. It is pointed out that of the feed mixtures examined in some instances 100 and in others more than 20,000 seeds were alive.

HORTICULTURE.

Horticultural investigations, N. O. Booth (*New York State Sta. Rpt. 1907, pt. 3, pp. 292–329, pls. 4*).—This is a summary of investigations which have been conducted with orchard and small fruits and vegetables at the station during the first 25 years since its establishment, including abstracts of the bulletins and other publications issued relative to the work.

Vegetable-fruit seed distribution for 1909, B. D. HALSTED (*New Jersey Stas. Bul. 218, pp. 3–28, pls. 4*).—The New Jersey stations have offered for distribution for 1909 to those willing to comply with the conditions several kinds of corn, tomato, eggplant, bean and squash seed, some 45 varieties in all, together with an ornamental, "White Star" phlox, which have been produced in connection with their plant-breeding investigations (E. S. R., 19, p. 1039). One variety of sweet corn, 2 of bush snap beans, and 2 of squash are also offered for home breeding purposes. The first part of this bulletin discusses the varieties offered for trial. Part 2 contains suggestions for the improvement and breeding of vegetables at home, together with notes on the varieties offered for breeding purposes. The general conditions of the seed distribution are also stated.

Mushroom culture, P. M. NÖVIK (*Norsk Havetidende, 24 (1908), No. 11, pp. 205–211, figs. 2*).—This article contains brief popular directions for growing mushrooms.

Fertilizer and irrigation experiments with onions, S. A. WASCHKA (*Texas Sta. Bul. 115, pp. 5–16*).—The results secured with comparative fertilizer and irrigation tests with Bermuda onions conducted through 4 seasons at the Beeville Substation are given, together with brief suggestions on the cultivation, harvesting, and marketing of onions.

The evidence secured from the 4 years' work with fertilizers indicates that soils similar to those at the Beeville station are not deficient in mineral elements and are more in need of humus than commercial fertilizers. Barnyard manure was the only fertilizer the use of which in large quantities justified the expense.

Comparative tests of the furrow and flooding methods of irrigation resulted in estimated gains in yield per acre by the flooding method of 4,200 to 7,000 lbs. of onions. The increased yields secured from irrigation as compared with dry culture indicate that irrigation is profitable even in seasons when the rainfall is sufficient to produce a good crop, but the work as a whole shows that by the use of cowpeas each year as a green manure and by watering the plants just after transplanting a profitable crop of onions can be grown in the Beeville section without other fertilizers or irrigation.

Data on the cost of irrigating onions and bunch crops have previously been reported (E. S. R., 17, p. 251).

Mendelian characters in tomatoes, U. P. HEDRICK and N. O. BOOTH (*Proc. Soc. Hort. Sci., 1907, pp. 19–24*).—This paper discusses the results secured from some hybridization experiments with tomatoes conducted by Hedrick in the seasons of 1903–1905, inclusive, and by the authors jointly in the years 1906–7. The work comprised a comparative study of the standard and dwarf characters of the tomato plant, and was pursued with the view of determining the practicability of originating new varieties of tomatoes by the Mendelian methods.

As a result of their work, the authors concluded that any 2 varieties of tomatoes differing in 2 or more characters may be crossed and forms secured which will contain any and all combinations of these characters. The work also indicated that it was actually necessary to raise 7 times as many tomatoes as are theoretically necessary, according to Mendel's work with peas (E. S. R., 13, p. 744), in order to secure any desired combination. There was a strong tendency for the second generation hybrids to revert to the same combinations of characters as the parents rather than to form new ones.

It was found that in raising tomatoes outdoors without the use of a greenhouse 3 years from the cross is sufficient time to form and fix any combination of characters, whereas it requires 8 to 10 years to fix types by the old method

of selection. By using a greenhouse for one generation a pear-shaped, yellow fruit was transferred from a standard to a dwarf vine in a year from the time the original cross was made. Since these characters were all recessive no further fixing was required.

Mendel's law applied in tomato breeding, A. G. CRAIG (*Proc. Soc. Hort. Sci., 1907, pp. 24–27*).—The results secured by the author in a test of Mendel's law as applied to tomatoes appear to have borne out the important features of the Mendelian theory, although the numerical proportions of the different character combinations secured as worked out by Mendel for peas (E. S. R., 13, p. 744) did not appear to hold for tomatoes. The author is of the opinion that unit characters and correlation of characters can be determined only by growing the hybrids resulting from any particular cross, except possibly where the pedigrees of both parents are known.

[A study relative to the influence of fertilizers on the structure of the tomato], O. M. MORRIS (*Oklahoma Sta. Rpt. 1908, pp. 13–15*).—Experiments were conducted for 3 successive years to determine whether different proportions of fertilizer ingredients applied to the soil would influence the relative amounts of seed pulp and solid flesh of the tomato. Several combinations of fertilizer and over 40 varieties of tomatoes were included in the work. The data secured indicate that there is practically no influence exerted by different fertilizers in increasing or decreasing the relative amount of solid flesh and seed pulp. The author also finds that the best varieties are not necessarily those that have the greatest proportion of solid flesh in the fruit.

Report of the South Haven Substation for 1907, L. R. TAFT and F. A. WILKEN (*Michigan Sta. Spec. Bul. 46, pp. 3–14*).—Notes are given in this report on the condition of the orchard and small fruits and nuts being tested at the substation (E. S. R., 20, p. 143), together with an outline of cultural and fertilizer tests and data on tests of some of the newer prepared scale-destroying mixtures, and a comparative test of the common arsenic compounds.

The season of 1907 was cold and backward. All of the peach trees at the station were winterkilled. Of the plums, only the Japanese varieties were affected, and Satsuma and Red June were the only varieties killed. All of the grapevines were killed back more or less, there being no difference noted in the resistance of varieties to the freeze. The Japanese walnuts, both the Sieboldiana and the Cordiformis, were seriously injured, the entire tops being killed except in limbs measuring 3 in. or more in diameter. The new growth of chestnuts was killed in most varieties, and the Japanese chestnuts were all killed. Hazelnuts and filberts, as well as the pecan, which is a southern tree, were not affected by the freeze. Generally speaking, the blossoms were 3 weeks behind their usual time and lasted for an unusually long period. Spring frosts did much damage to cherry and early strawberry blossoms.

New varieties of strawberries which fruited at the station are described, and lists are given of the gooseberries and currants showing the degree of freedom from cane borers, and of varieties of apples subject and not subject to injury from Bordeaux mixture. In the spraying tests none of the prepared scale-destroying mixtures were as satisfactory as the home-made lime-sulphur wash. Arsenate of lead was found to be superior to the other arsenic compounds in spraying for the prevention of wormy apples.

Fifth biennial report of the Montana State Board of Horticulture (*Bien. Rpt. Mont. Bd. Hort., 5 (1907–8), pp. 63, figs. 21*).—This report contains a review of the work done by the State board of horticulture, statistics showing the volume and character of the fruit industry in Montana, and other information

of practical value to fruit growers, relative to varieties, cultural methods, and insect pests and diseases and their control.

The small fruits: Information concerning their culture, J. TROOP (*Indiana Sta. Bul. 128, pp. 219–230*).—This bulletin contains popular directions for growing strawberries, raspberries, blackberries, currants and gooseberries.

Variety test of strawberries and cultural directions, O. M. TAYLOR (*New York State Sta. Bul. 309, pp. 507–557, pls. 8, figs. 2*).—This bulletin contains notes and descriptions of 89 varieties of strawberries tested at the station during the seasons of 1907 and 1908, many of which are recent introductions.

Lists are given of the varieties producing very many plants, those producing very few plants, those early and late as to season, those productive and unproductive, varieties having a desirable size throughout the season, early and late bloomers, and those possessing marked desirable characters. Brief general directions on strawberry culture are also given.

A large number of varieties fruited in midseason. Most of the early kinds produced only 1 or 2 satisfactory pickings, but Golden Gate and St. Louis were very productive. All of the 7 late varieties tested possessed marked desirable characters. Arnouts, a main season variety, was the most productive, yielding at the rate of 14,409 qt. per acre. Nineteen varieties gave a yield of 8,189 qt. and over. No insect injury occurred during the test, and 69 kinds were free from disease, or nearly so. Twenty varieties were strongly susceptible to attacks of leaf blight.

Some newer strawberries, O. M. TAYLOR (*New York State Sta. Bul. 309, popular ed., pp. 11*).—This is a popular edition of the above.

Culture v. nonculture with grapes, A. VIVIER (*Jour. Agr. Prat., n. ser., 17 (1909), No. 3, pp. 77, 78*).—In the autumn of 1902 the ground of one portion of a small grape vineyard was covered with a layer of basic slag about 4 in. thick. This part of the plat received no further cultivation, while the other portion of the plat has been cultivated in the usual manner. As indicated by the yields, the difference in favor of the mulched portion was 25 per cent in 1906 and 26 per cent in 1907. The experiment was repeated on other plats during the past season, the basic slag being applied in the autumn of 1907. The results for the first season, however, showed a yield of 13.5 per cent less grapes for the basic slag plat than for the plat receiving ordinary culture. The experiment is to be continued.

The grapes of New York, U. P. HEDRICK ET AL. (*New York State Sta. Rpt. 1907, pt. 2, pp. XV+564, pls. 101*).—This comprehensive work is a companion volume to The Apples of New York, previously noted (E. S. R., 17, pp. 559, 1157). Although its title implies that it is a local study, its real purpose is to record the state of development of American grapes, and the varietal descriptions contained therein are offered as its chief contribution to the pomology of the country. Brief historical narratives are given of Old World and New World grapes, as well as an account of the grape regions and of grape growing in New York, with statistics relating to the grape, wine and grape juice industries in that State. The species of American grapes are next discussed, the classification adopted being that used by Bailey in his monograph of the Vitaceæ in Gray's Synoptical Flora. The synonymy, bibliography, economic status, and full descriptions are then given of all the important varieties of American grapes. Life size color-plates are shown of varieties which from various standpoints are considered most important. The footnotes contain brief biographical sketches of those persons who have been prominently connected with the evolution of the grape and grape growing in America, together with some other historical and explanatory notes. The minor varieties of American grapes are

briefly described and a rather complete bibliography is given of grape literature in the United States.

Notes on the time of blossoming of fruit trees, C. H. HOOPER (*Jour. Bd. Agr. [London], 15 (1908), No. 9, pp. 678–687*).—Daily observations were made during the spring of 1908 on the condition of the blossoms of several varieties of fruit in the plantations of the Wye Agricultural College, with the view of ascertaining the period when the blossom is most susceptible to injury by frost.

With the exception of apricots and Japanese plums, little damage was done to the blossoms by frost in 1908. The present notes, however, contain considerable information relative to early and late blooming varieties of the various fruits, as well as on the duration of the blooming period.

The American apple orchard, F. A. WAUGH (*New York, 1908, pp. X+215, pl. 1, figs. 36*).—This work is designed as a sketch of the practice of apple growing in North America at the beginning of the 20th century. Consideration is given to all of the important phases of apple culture, including the geography of apple growing, soils, exposures, wind-breaks, winterkilling, planting operations, cultivation, cover crops, pruning, fertilizers, insect pests, fungus diseases and other orchard troubles, spraying machinery and spraying solutions, harvesting and marketing, the family orchard, renovation of old orchards, and selection of varieties. The work concludes with a list of the best-known varieties, with condensed descriptions.

Planting apple orchards in Idaho, J. R. SHINN (*Idaho Sta. Bul. 64, pp. 3–37, pls. 11, maps 2*).—This bulletin on the planting of apple orchards is designed to meet the needs of new settlers and other inexperienced growers. Practical suggestions are given relative to the selection of orchard sites and varieties, preparing the land, drainage, irrigation, various systems of planting, and care and protection from injurious vermin during the early life of the trees.

Orchard survey of Jackson County, C. I. LEWIS, S. L. BENNETT, and C. C. VINCENT (*Oregon Sta. Bul. 101, pp. 3–55, pls. 15*).—The character of the survey reported in this bulletin is similar to that previously noted for Wasco County (E. S. R., 20, p. 336). Studies were made of orchard sites, soils, cultivation, fertilizers, irrigation, drainage, planting systems, kinds and varieties of fruit, age of orchards, pruning, thinning, fungus diseases, insects, yields, harvesting, marketing, and prices received.

The total number of orchards in the county was found to be 473, containing 9,675.4 acres, of which 5,972.97 acres were planted to apples, 2,189.43 acres to pears, and the remainder to prunes, plums, cherries, apricots, almonds, and mixed orchards. Yellow Newton and Spitzenberg were the leading varieties of apples. Of the pears Bartlett was slightly in the lead, followed by Comice and Bosc. The orchard elevations varied from 1,200 to 2,600 ft.

A large percentage of the trees were under 6 years of age. The maximum yields were found in trees from 15 to 30 years of age. Older trees were declining in yield because of neglect. Practically 74 per cent of the orchards received good cultivation, however, and only 1½ per cent, largely home orchards, were totally neglected. Only 5 per cent of the growers used commercial fertilizer, 5 per cent cover crops, and 70 per cent stable compost in very limited quantities. Ten per cent of the growers were irrigating and others preparing to do so. Eighty-three per cent of the growers favor winter pruning and 11 per cent prune both winter and summer.

Anthracnose was the most noticeable fungus disease, being found in 61 orchards. Other diseases noted in lesser quantities were, blight, crown gall, shot-hole fungus, and apple scab. Of the insects the codling moth was noticeably present in 141 orchards. San José scale was found in 98 orchards, the

aphis in 58, and borers in 31 orchards. There was considerable difference of opinion as to the best date and number of applications to make in spraying for codling moth. Eighty per cent spray when the petals fall, 21 per cent wait until the moths appear, 85 per cent make 4 applications, and 12 per cent but 2 applications.

The practical culture of coffee trees, A. Fauchère (*Culture Pratique du Caféier et Préparation du Café. Paris, 1908, pp. 198, pls. 12, figs. 37, dgms. 4*).—This is a treatise on the culture and preparation of coffee for the market with special reference to the development of the industry in Madagascar. Consideration is given to the natural distribution, history, species and varieties of coffee, climate and soils, details of culture and management of coffee plantations, diseases and insects. The various processes in preparing coffee for the market, together with the equipment, are also described, and estimates are given on the cost of establishing and maintaining plantations. An appendix deals with the present importance and future possibilities of *Coffea arabica* as a variety for growing in Madagascar.

Some observations on modern coffee culture in Java, G. E. Schuurman (*Indische Mercuur, 32 (1909), No. 3, pp. 39–42*).—A paper on this subject presented to the Dutch section of the Dutch-Indes Agricultural Society, January, 1909.

Holly, yew and box, with chapters on other evergreens, W. Dallimore (*New York and London, 1908, pp. XIV+284, pls. 43*).—In this popular work the author describes the more important hollies, yews and boxes desirable for ornamental purposes, and gives notes on their culture and uses, together with extracts from various works on the superstitions, legends, poetry, etc., attached to each group. Brief cultural notes and descriptions are also given of several other useful evergreens.

The peony, J. E. Coit (*New York Cornell Sta. Bul. 259, pp. 73–145, pls. 20*).—This is the second progress report (E. S. R., 19, p. 342), on the peony investigations which are being cooperatively conducted by the American Peony Society and the Cornell Station, with a view to correct the confused nomenclature and establish the botanical status of all varieties of peonies, as well as to determine the commercial value of different kinds and to work out improved cultural methods. The station is testing an extensive number of varieties received from various sources.

The present report deals with the history, culture, and classification of peonies, together with descriptions of varieties which produced typical blooms at the station during the past season. The author outlines the history of the various species and discusses the early development of the peony as a popular flower. He has worked out an artificial key for classification purposes based upon the descriptions of species made by J. G. Baker in his Monograph of the Genus Paeonia. Other phases discussed include propagation and culture; evolution and horticultural classification; diseases and insects; and the methods of describing varieties. A chronological bibliography of peony literature is also given.

Dahlias and their cultivation, J. B. Wroe (*London, 1908, pp. 100, pl. 1, figs. 28*).—This work is offered as a practical treatise on the history, culture, and propagation of various types of dahlias for exhibition and garden decoration, with hints on staging and judging of flowers, as well as selections of varieties for all purposes.

Mesembryanthemum and portulacas, A. Berger (*Mesembrianthemen und Portulacaceen. Stuttgart, 1908, pp. V+328, figs. 67*).—This handbook contains descriptions and keys for classifying the important species of mesembryanthemum and portulacas, together with brief directions for their culture.

The perfect garden, W. P. WRIGHT (*London, 1908, pp. XII+408, pls. 30*).—In this popular work the author discusses garden making from æsthetic and cultural points of view and gives practical hints on economical management and the culture of all the principal flowers, fruits, and vegetables. The text is fully illustrated, and several plans for different types of gardens are appended.

Garden book, J. BIGGLE (*Philadelphia, 1908, pp. 184, pl. 1, figs. 81*).—This is a pocket handbook containing practical directions and hints for growing vegetables, small fruits, and flowers for pleasure and profit.

FORESTRY.

Silviculture based on natural principles, H. MAYR (*Waldbau auf naturgesetzlicher Grundlage. Berlin, 1909, pp. VII+568, figs. 27*).—In this treatise on silviculture the author has aimed to bring the observations and results of scientific investigations and silvicultural practice into harmonious unison. The subject-matter is treated under the general headings of the natural principles of silviculture, forest formation, and care and rearing of forests.

In part 1 consideration is given to the natural laws affecting forest distribution; the natural foundations of the forest regions of the Northern Hemisphere outside of the Tropics; the interior relations of these regions; the natural requirements of individual species; their silvicultural-physiological and silvicultural-biological properties; the scientific-silvicultural characteristics of the important forest trees and shrubs; the biology of forest stands; and alterations in natural forest conditions effected by man. Part 2 discusses the various systems of forest management; the factors influencing the choice of a system of management; natural and artificial regeneration methods; the culture of exotic species; and afforesting waste lands. Part 3 deals with the care and tending of forests.

In the concluding chapter the author advocates and describes a system of forest management, the small compartment woods (Kleinbestandswald), which system he believes will provide for forest development along both natural and economic lines. In the small compartment forests the districts and compartments may be based on technical considerations, but the subcompartments, which may vary from 0.3 hectare to 3 hectares (from 0.74 to 7.41 acres) in size, each consist of a different species. The whole forest is then composed of a large number of small, pure stands. In certain situations, such as mountains, high hills, and sandy and wet lands, it may be found desirable to increase the size of the subcompartments to 5 hectares and to grow the same species in neighboring compartments, although in the latter case the age-class of the adjoining stands should vary considerably.

The fundamental principles of forest management, A. HENZE (*Die Hauptgrundsätze des Forstbetriebes. Hanover, 1908, pp. 115, figs. 9*).—This is a popular book treating of the elements of silviculture and forest management. The work is designed primarily for farmers owning woodlands, and as a textbook for agricultural schools.

The range-officer system in the German state forest administration, O. VON BENTHEIM (*Das Oberförstersystem in den deutschen Staatsforstverwaltungen. Berlin, 1908, pp. 219*).—In this work the author traces the development of the range-officer system in German forestry, and presents evidence to show that, although great improvements have been brought about in forest management, the system has not been completely developed. He attributes many unfavorable existing forest conditions in Germany to this lack of completion, and concludes with suggestions for a more thorough development of the range-officer system.

The value of normal yield tables in forest management, E. Ostwald (*Ztschr. Forst. u. Jagdw., 41 (1909), No. 1, pp. 14–27*).—The author advances the opinion that most of the yield data which have been gathered in experimental work have been formulated to meet the needs of scientific investigators rather than practical foresters. With the view of illustrating a system of formulating the data which shall be of value to practical foresters, he presents and discusses a series of 8 yield tables which are based on the yield data secured by Schwappach in his work with the pine (E. S. R., 7, p. 961; 20, p. 644).

Report on forest conditions in Delaware and the forest policy for the State, W. D. Sterrett (*Delaware Sta. Bul. 82, pp. 3–58, figs. 10, map 1*).—Results are given of a cooperative study of forest conditions in Delaware made by the station and the Forest Service of this Department with the purpose of recommending practical measures for the management of the various classes of woodland and of formulating a definite forest policy for the State.

The two general lines of action recommended and discussed are the encouragement of forestry by private owners and the establishment of State forests. Lists are given of species indigenous to the State, grouped according to their commercial importance, together with remarks on their occurrence, and suggestions relative to the establishment and management of forest plantings.

Most of the land in the State was found to be too valuable for agricultural purposes to be used for growing forests. The author points out the desirability of the woodlot on the farm, however, and also advises the planting of trees to serve as wind-breaks and shelter belts. Since Delaware has a climate and soils well adapted to extremely rapid tree growth and a favorable market for forest products, it is concluded that timber growing, with careful treatment, can be made a profitable enterprise anywhere in the State on lands not valued at more than $15 per acre for agriculture.

Report of the State forester of Wisconsin for 1907–8, E. M. Griffith (*Rpt. State Forester Wis., 1907–8, pp. 5–133, pls. 11*).—This report discusses the condition of State forest operations for 1907–8, and contains suggestions for handling local forest problems of various kinds, such as reforestation, fire protection, timber trespass, forest taxation, and necessary legislation. An appendix contains the State forestry laws for the years 1905 and 1907.

Forest trees of the Pacific slope, G. B. Sudworth (*U. S. Dept. Agr., Forest Serv., 1908, pp. 441, pls. 2, figs. 207*).—This volume, now withdrawn from circulation, contains an account of the tree species, 150 in all, known to inhabit some part of the region including Alaska, British Columbia, Washington, Oregon, and California, many of which trees occur wholly within this region. Since the work is nontechnical in character, the artificial keys of families, genera, and species are omitted, and the many full-sized illustrations of the leaves, fruits and seeds have been made a special feature for the purpose of identification. Each species is considered relative to its distinguishing characteristics, longevity, range, occurrence, climatic conditions, tolerance, and reproduction.

The afforestation of poor agricultural soils, K. J. Möller (*Aufforstung Landwirtschaftlich Minderwertigen Bodens. Berlin, 1908, pp. IV+102*).—This work, which was given a prize by the department of the interior of Saxony, consists of a study of the expediency of afforesting lands which are either poor or of no value for agricultural purposes with special reference to small estates. The subject is discussed under 2 general headings. In part 1 the author considers to what extent the afforestation of these lands is advisable. In part 2 he discusses ways and means for afforesting such lands on small estates. An appendix contains regulations and sample statutes for the organization of forestry associations.

The afforestation of the infertile lands of small estates from the standpoints of agricultural and forest policy, R. Beck (*Die Aufforstung der unrentablen Flächen des Landwirtschaftlichen Kleinbesitzes vom Agrar- und Forstpolitischen Standpunkte aus betrachtet. Berlin, 1908, pp. 99*).—In this prize essay, which is similar in character to the one noted above, the author first considers the question as to what lands are suitable for afforestation purposes, and then discusses the ways and means for bringing about this afforestation.

Moss cover and natural regeneration, K. Böhmerle (*Centbl. Gesam. Forstw., 35 (1909), No. 1, pp. 22–27*).—An account with the data secured is given of investigations conducted at the Mariabrunn Forestry Station relative to the effect of moss covered ground on natural regeneration.

The results of this study indicate that a mossy cover, other conditions being equal, is not favorable for the germination of seeds falling on such ground. During periods of drought the mossy cover exerts a favorable influence as long as it remains moist by supplying the root systems with additional moisture. This influence is only temporary, however, and in the experimental areas the number of plants growing on moss-free ground was found to be considerably greater than that growing on mossy ground.

The plant biology of the Flemish dunes, C. De Bruyne (*Handel. Vlaamsch Natuur en Geneesk. Cong., 10 (1906), I, No. 1–2, pp. XXXVII–LXXX, figs. 50*).—In this paper the author discusses the various plant formations existing on Flemish sand dunes and their value for sand-binding purposes.

The future use of land in the United States, R. Zon (*U. S. Dept. Agr. Forest Serv., Circ. 159, pp. 15, map. 1*).—In this circular the author points out the importance of land as a natural resource and contrasts the present condition and extent of our agricultural, grazing, desert, forest, and intermediate lands with their probable condition and extent 50 years from now as influenced by the needs of an increased population. He shows that with an increasing demand for land for agricultural crops there is little hope of increasing the extent of forest land. He presents data drawn from forest conditions in our own and other countries to support the conclusion that the growing demand for wood material must be met by an increase in the productiveness of existing forest lands and a decrease in the waste.

Forests and reservoirs in their relation to stream flow with particular reference to navigable rivers, H. M. Chittenden (*Cong. Rec., 43 (1909), No. 47, pp. 2102–2121*).—An extensive paper on this subject which was prepared for discussion before the American Society of Civil Engineers.

The author takes exception to the rather commonly accepted opinion relative to the beneficial influence of forests on stream flow, and advocates the preservation of the forests independent of their relation to the rivers, which latter he believes can best be regulated by the establishment of reservoirs.

Wholesale lumber prices, 1886–1908 (*U. S. Dept. Agr., Forest Serv., 1908, folio*).—This is a schedule of market quotations for various species and grades of lumber based on figures quoted by the *New York Lumber Trade Journal*, the Redwood Association, and the Yellow Pine Manufacturers' Association. The figures in most instances are based on the January prices for each year.

DISEASES OF PLANTS.

The development of plant pathology during the past ten years, R. Solla (*Riv. Patol. Veg., 3 (1908), No. 1–3, pp. 1–36*).—A summary is given of the present status of plant pathology, and some of the more conspicuous discoveries and noted advances made during the past 10 years are described at some length.

In compiling the information the author has searched the literature quite extensively, and a list of more than 150 titles is given.

Report on plant protection (*S. Internat. Landw. Kong. Wien. 3 (1907), Sect. VII, Refs. 1, pp. 81; 2, pp. 33; 5, pp. 21*).—A series of papers is given that were presented to the International Agricultural Congress at its meeting in Vienna in 1907. The papers discuss the means adopted for the control of plant diseases, insect pests, nematodes, etc., and the organization and results obtained in some of the countries represented in the International Union for Plant Protection. Among the papers describing the status of the organization and work in different countries are the following: For Sweden, by J. Eriksson; Belgium, E. Marchal; Denmark, F. G. E. Rostrup; Germany, R. Aderhold; Holland, J. Ritzema Bos; Italy, B. Moreschi; Austria, K. Kornauth; Russia, A. Jaczewski; Switzerland, H. Müller-Thurgau; and Hungary, J. Jablonowsky. Summaries are given on the prevention of plant diseases through cultural methods and the utilization of individual and varietal resistance, by P. Sorauer, G. Pammer, and E. Zederbauer. Reports on nematode control are given by J. Ritzema Bos and J. Spiegler.

Botanical investigations. F. C. Stewart (*New York State Sta. Rpt. 1907, pt. 3, pp. 119–162, pls. 4, map 1*).—A summary is given of the work in the investigation of plant diseases and their treatment that has been carried on during the 25 years of the existence of the station. An account is presented of most of the important diseases of economic plants, together with suggestions for their control. The publications relating to fungicides and insecticides and spraying machinery, the work on weeds, and some miscellaneous investigations are also briefly summarized.

Diseases of field crops in Delaware in 1907. H. S. Jackson (*Delaware Sta. Bul. 83, pp. 3–25, figs. 12*).—A popular account is given of some of the more prevalent field-crop diseases observed during 1907 in Delaware, together with observations as to their prevention.

Among the diseases described at some length are clover dodder (*Cuscuta epithymum*), anthracnose of red clover (*Colletotrichum trifolii*), leaf blight of German millet (*Piricularia grisea*), oat smuts (*Ustilago avenæ* and *U. læris*), corn smut (*U. zeæ*), loose smut of wheat (*U. tritici*), powdery mildew of wheat (*Erysiphe graminis*), and leaf spot of cowpeas (*Cercospora cruenta*). In addition to the diseases mentioned above, the occurrence of a number of other fungi is reported.

Report of the acting botanist and plant pathologist. I. B. P. Evans (*Transvaal Dept. Agr. Ann. Rpt. 1907, pp. 155–172*).—After briefly reporting upon the botanical work carried on during the absence of the botanist, an account is given of the plant diseases which were investigated, the principal ones being the bitter pit affecting apples, rusts of cereals and other economic grasses, coffee rust with its allied fungi, and the South African locust fungus.

In the study of cereal rusts, the author has shown that oats, which seem to be free from rust in India, are readily infested from cultures of *Uredo coronifera* and *U. graminis*. Of the inoculated plants, those receiving spores of *U. coronifera* were much more severely attacked than those to which the other fungus was applied.

A study was made of the rust occurring on *Rhamnus prinoides* to ascertain whether it might not be connected with the crown rust of oats. As a result of inoculation experiments the author found that the æcidiospores did not germinate as ordinary æcidiospores but as teleutospores. A further examination of the fungus led the author to the conclusion that it is not *Puccinia coronata*, but belongs to the genus Endophyllum, and the name *E. macowanianum* n. sp. is

proposed for it. The inoculation experiments with this fungus on oats failed to develop any pustules.

A study was made of the coffee rust (*Hemileia vastatrix*), which is said to have practically ruined the coffee industry of the Colony within the last 10 years. It has been suggested that the species *H. woodii*, which occurs on native South African shrubs, might possibly affect coffee, but inoculation experiments have failed to show that this species would grow on coffee or that the coffee rust would infect the host plants of *H. woodii*. A new species of Hemileia, which is parasitic on another shrub, has been recently discovered, but inoculation experiments failed to infect the coffee plant with that rust.

Notes are given on the occurrence of the downy mildew of grapes, which threatens to become troublesome in Southern Africa; on the bitter pit of apples, upon which a report has been prepared, but which is withheld from publication until additional experiments are completed; and upon the locust fungus. Investigations on the locust fungus have shown that no fatal effects can be attributed to the fungus *Mucor exitiosus*, so far as locusts are concerned, the fungus probably being a purely saprophytic one that was not distinguished by the original cultivators from *Empusa grylli*, a true parasite.

Report of vegetable pathologist, H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1907–8, pp. 89–92*).—Notes are given on a number of diseases which have been under observation during the year covered by the report. Among those discussed are a rust of alfalfa, due to *Uromyces striatus*; a tobacco spot disease, caused by *Cercospora raciborskii*, which is said to impair the value of the tobacco crop, and so far as known occurs only in Australia and Java; a leaf blast of sisal hemp that is due to sudden meteorological changes; a disease of oranges caused by the fungus *Mycocopron* sp., which involves the rind of the fruit, causing it to be covered with minute black specks; and a disease of grapes caused by the fungus *Strumella vitis*.

An account of the inspection work carried on under the Diseases in Plants Act of 1896 completes the report.

Annual report of the government mycologist, 1907, W. J. Gallagher (*Agr. Bul. Straits and Fed. Malay States, 7 (1908), No. 12, pp. 588–590*).—Brief notes are given on the root disease of Para rubber trees due to *Fomes semitostus*; a bacterial disease of mangosteens, in which 25 per cent of the fruits were attacked; a disease of rice due to *Helminthosporium* sp., etc.

The wood-destroying fungi, J. Schorstein (*Separate from Ztschr. Österr. Ingen. u. Architekten Ver., 60 (1908), No. 45–46, pp. 7, figs. 22*).—An illustrated account is given of some of the more common wood-destroying fungi, 22 species being noted that occur on dead or living trees and 7 species which attack timber in houses and other structures.

The destruction of fungi by grain-drying apparatus, H. Lang (*Illus. Landw. Ztg., 28 (1908), No. 70, pp. 603, 604*).—A description is given of a modified seed treatment for the prevention of smut of cereals.

The seed after being soaked for 6 to 12 hours in water at ordinary temperature is plunged in hot water or subjected to air heated to 60° C. in a drying apparatus. This treatment is said to destroy the fungus spores, but in no way to injure the seed. Barley treated in this manner gave but 2.5 smutted plants as compared with 2,140 on an equal area the seed for which was treated with formalin and 2,735 smutted plants where no preliminary treatment was given the seed.

A successful experiment in combating the smut of barley, L. Kühle (*Illus. Landw. Ztg., 28 (1908), No. 67, pp. 578, 579*).—A description is given of experiments made to test the hot-air treatment for the prevention of smuts of wheat and barley.

It was found that an exposure of smut spores for 12 minutes to a temperature of 65° C. would destroy them. Further tests showed that barley would withstand a dry heat of 90° and wheat 110° without injury to germination. Where grain did not contain more than the average amount of moisture it was found to readiiy withstand a temperature of 65°, and field tests showed that barley smut was entirely absent from plats the seed for which had been treated with hot air. The experiments with wheat were less successful.

Potato diseases in San Joaquin County, California, W. A. Orton (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 23, pp. 14*).—A study was made as to the cause of the failure to produce successful crops of potatoes on the tule or peat lands in the deltas of the San Joaquin and Sacramento rivers. These lands are apparently very fertile and produce phenomenally large crops when first planted, but in a few years the yield diminishes and the tubers become so rough and scabby as to be practically worthless.

The principal cause of the trouble was found to be due to the potato wilt (*Fusarium oxysporum*). This disease, which has been previously noted (E. S. R., 15, p. 1088), is again described and suggestions offered for its control. A second cause of trouble is said to be the potato scab, due to *Oospora scabies*, while a third cause of considerable loss is a decay of potatoes locally known as "leak" or "melters." This is due to the invasion of the fungus *Rhizopus nigricans*. The affected potatoes turn a dull brown outside; the flesh is buff or brown and very soft and exudes a clear brown liquid.

For the wilt and the scab, rotation of crops, the use of resistant varieties, etc., are recommended, together with the disinfecting of the seed potatoes in the case of scab, while for the trouble caused by *R. nigricans* the author suggests care in handling the potatoes so as to prevent wounding, the practice of sanitary precautions to prevent infection, and the avoidance of placing newly dug potatoes in large piles where they will sweat.

Spraying potatoes against blight and the potato beetle, E. P. Sandsten and J. G. Milward (*Wisconsin Sta. Bul. 168, pp. 3–27, figs. 13*).—The Wisconsin Station has been carrying on spraying trials for the past 5 years in the leading potato-growing counties of the State to determine whether the early blight (*Alternaria solani*), which is the only form of blight prevalent in the State, can be controlled by the application of Bordeaux mixture, and also to determine whether spraying should be recommended as a profitable investment and insurance against blight. In all, over 200 acres have been under trial as described in the bulletin.

Directions are given for the preparation and application of fungicides and insecticides. A test was made of dry versus wet Bordeaux mixture, in which a gain due to spraying with dry Bordeaux mixture of 10 bu. per acre was obtained as compared to a gain for the standard Bordeaux mixture of 33 bu. per acre.

For the control of the potato beetle, the authors recommend various poisons. The results thus far obtained indicate that the spraying of standard late varieties can be followed with an assurance of profit. Substantial increases in yields were obtained from spraying early varieties which were planted late, but the spraying of early varieties planted early seldom proved profitable.

Potato spraying experiments in 1907, F. C. Stewart, G. T. Frencii, and F. A. Sirrine (*New York State Sta. Bul. 307, pp. 439–468*).—This bulletin gives the results of the sixth year's work in the 10-year series of potato spraying experiments which were begun in 1902. The experiments were conducted along the same lines as in previous years (E. S. R., 19, p. 447), 40 separate experiments being reported.

In the 10-year experiments at Geneva, 5 sprayings with Bordeaux mixture and Paris green or Bordeaux mixture alone increased the yield 73.7 bu. per acre and 3 sprayings increased it 44 bu. notwithstanding the fact that the amount of damage done by blight and insects was seemingly small. There was no potato rot found. At Riverhead the gain due to 6 sprayings was 31.25 bu. per acre and to 3 sprayings 18 bu.

In the cooperative experiments with farmers, which included 152.75 acres, the average gain due to spraying was 36.8 bu. per acre, yielding an average net profit of $17.07 per acre.

In experiments conducted by 24 volunteers, gains averaging 30.5 bu. per acre are reported.

Diseased potato seed (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 5, p. 857, pl. 1*).—A brief note is given reporting the presence in seed potatoes of a disease known as the spindle disease, due to *Persola tomentosum*. Potatoes affected by this disease put out weak sprouts and their value for seed purposes is greatly reduced.

The Granville tobacco wilt, E. F. Smith (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 141, pt. 2, pp. 17–24*).—Attention was first called to this disease by publications of this Department and also of the North Carolina Station (E. S. R., 15, pp. 684, 685), and the author states that the diagnosis given in the North Carolina publication describing the disease and attributing it to bacteria is correct.

The bacterial origin of the disease is discussed and some recent experiments of the author's described, in which it is demonstrated that the disease is readily communicated to tomatoes through the root system. The cultural characters of the tobacco organism are the same as those of *Bacterium solanacearum* derived from tomato or potato, and there is no doubt but that the Granville wilt of tobacco and the brown rot of the potato, tomato, and eggplant are all due to the same organism. In the case of tobacco it seems probable that the main infection takes place through the root system. A very considerable extent of the destructive prevalence of the disease seems to be coincident with the abundant occurrence of root nematodes.

For the control of the disease, planting tobacco only on uninfected land, reducing the amount of infectious material as much as possible, avoiding the wounding of roots in transplanting, and breeding resistant varieties as far as possible are among the measures recommended.

The black rot of grapes, L. Ravaz (*Ann. Sci. Agron., 3. ser., 3 (1908), II, No. 2, pp. 179–182*).—This is a paper presented before the International Congress of Agriculture held at Vienna in 1907, in which the author gives an account of the black rot of grapes and discusses means for its control.

In France, it is said, the fungus has rather definite periods or cycles of appearance during the season. For its prevention vines should be sprayed with some of the fungicides containing copper compounds at intervals of 8 to 10 days during the early part of the season. Later applications are to be made whenever spots caused by the fungus are noticed on vines left unsprayed to serve as indicators of the presence of the disease.

The control of the gray rot of grapes, G. Istvanffi (*Ann. Sci. Agron., 3. ser., 3 (1908), II, No. 2, pp. 196–230*).—An account is given of studies on the control of the gray rot of grapes due to the fungus *Botrytis cinerea*, the conidial phase of *Sclerotinia fuckeliana*. The method of attack, development and biology of the fungus, varietal resistance of grapes to attack, etc., are described, after which the treatment by means of powders, liquid fungicides, etc., are discussed.

As precautionary and preventive measures the author recommends the collection and burning of leaves, dried grapes, etc.; the application of strong solutions of fungicides to the canes about 2 weeks before pruning; the reduction of humidity where possible; the avoidance of nitrogenous fertilizers; thinning of the grapes; and the use of liquid fungicides which are as adherent as possible and of powdered fungicides containing soluble copper and other materials which are readily decomposed. Among the solutions the best results were obtained with Bordeaux mixture containing gelatin or sugar, copper acetate solutions, and a solution of sulphate of nickel. Among the powders a mixture of copper acetate or copper sulphate and bisulphite of soda has given the best results.

A bibliography is appended.

The white rot of grapes. G. Istvanffi (*Ann. Sci. Agron., 3. ser., 3 (1908), II, No. 2, pp. 183–196*).—An account is given of the author's investigatons on the white rot of grapes due to *Coniothyrium diplodiella*, together with means for its control, based upon an extensive study of this subject, which has been previously noted (E. S. R., 15, p. 164). Some additional information has been gained regarding the disease and especially concerning its control. Spraying with a 3 or 4 per cent Bordeaux mixture and later dusting with a powder containing some form of copper and bisulphite of soda is recommended for application to the young shoots and the grapes. All diseased leaves, shoots, and grapes should be collected and burned as completely as possible. The application of the fungicides to the grape clusters should be begun immediately after flowering.

A brief bibliography is appended.

Lathræa squamaria as a parasite of the grape. H. Faes (*Rev. Vit., 30 (1908), No. 783, p. 700*).—In a brief note the author calls attention to the appearance of *L. squamaria* on the roots of grapes, previous investigators having considered it of rare occurrence. In one locality the vines are said to have suffered severely. As the upper part of the parasite annually dies to the ground, the injury has generally been attributed to phylloxera, but the author thinks that, at least in the instances described by him, the principal cause of injury is this phanerogamic parasite.

Apple scab or black spot. E. S. Salmon (*Jour. Bd. Agr. [London], 15 (1908), No. 3, pp. 182–195, figs. 9*).—An account is given of the scab or black spot of the apple, due to *Venturia pomi*, a disease which is said to be causing considerable damage in the orchards of England. Attention is called to the varying susceptibility of different varieties to attacks of this fungus.

For the prevention of the disease, thorough spraying with a Bordeaux mixture composed of copper sulphate 4 lbs., lime 4 lbs., and water 50 gal. is recommended. Where the disease appears late in the season, to avoid the discoloring due to Bordeaux mixture, ammoniacal copper carbonate solution is recommended. As additional treatment, the author suggests a winter washing of the trees with a rather strong copper sulphate solution.

Review of information relating to olive diseases. Cuboni (*Ann. Agr. [Italy], 1908, No. 256, pp. 83–91*).—In the report of the consulting commission on olive culture and oil making, an account is given of the diseases to which the olive tree is subject, particular attention being paid to those due to the fungi *Cycloconium oleaginum*, *Capnodium salicinum*, and *Stictis panizzei*, and suggestions are given for their control, as far as definite means are known.

[Spraying peaches and plums]. O. M. Morris (*Oklahoma Sta. Rpt. 1908, pp. 16, 17*).—A brief account is given of spraying peaches and plums with half-strength Bordeaux mixture for the purpose of protecting them from the attacks of brown rot. Four applications of the fungicide were given the trees, which

practically protected them from the disease. Trees not sprayed lost almost the entire crop.

Peach rot (*Oklahoma Sta. Rpt. 1908, pp. 78, 79*).—Directions are given for the prevention of peach rot by the use of applications of Bordeaux mixture or ammoniacal copper carbonate.

Studies in cacao disease, J. H. Hart (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 11, pp. 503–508*).—The author gives an account of an injury caused to cacao by the fungus *Diplodia cacaoicola*. This fungus, it is said, causes the brown rot of the pod and die back of the branches, and also affects the roots of the trees. Attention to plantations, pruning out and burning affected portions, and cultivation resulting in an active growth of the trees are recommended as preventive measures.

Inoculation experiments with Peridermium strobi from Pinus monticola, F. W. Neger (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 12, p. 605*).—In order to determine the alternate host plant for the peridermium stage of *Peridermium strobi* from *Pinus monticola*, the author planted in 1905 a number of currant bushes among a vigorous stand of 18-year-old trees of *P. monticola*. The species of Ribes planted were *R. sanguineum*, *R. alpinum*, *R. rubrum*, *R. aureum*, and *R. grossularia*.

From 1905 to 1907 there was no trace of the uredo or teleuto forms on any of the plants. In 1908 the infection made its appearance but was found only on *R. sanguineum*. The investigations indicate that *R. alpinum* is not the alternate host for the peridermium of the species that occurs on *P. monticola*, but probably is the alternate host for the forms occurring on the stone pine (*P. cembra*).

The use of copper fungicides, K. von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 6 (1908), Nos. 3, pp. 200–203, figs. 3; 4, pp. 229–235, figs. 3; 5, pp. 284–288, figs. 2*).—The action of various copper fungicides is described and notes given on their successful use in combating a number of plant diseases, particularly those of fruits, grapes, and potatoes. The fungi and the effect on their host plants are described, after which directions are given for the preparation and use of copper sulphate solutions, Bordeaux mixture, soda Bordeaux, etc.

Sulphur as a pest remedy, C. F. Juritz (*Agr. Jour. Cape Good Hope, 33 (1908), No. 6, pp. 719–730, figs. 5*).—On account of numerous inquiries regarding the kind of sulphur suitable for combating powdery mildew of grapes, sheep scab, and scale in orchards, the author has made a study of the different forms of sulphur found in commercial use to determine their value as remedies for these troubles.

As the form of sulphur is of most importance in combating powdery mildew, this phase formed the principal portion of the investigation. The action of sulphur when used as a fungicide is said to be due to the destructive effect on the mycelium and spores of the fumes which are given off when the weather is sufficiently warm. In order to have the proper effect it has been found that the sulphur must be evenly distributed and must be in actual contact with all the diseased parts of the vine. Studies were made of the fineness, purity, dampness, and presence of free sulphuric acid in the different samples, and it was found that sulphur, whether ground or in the form known as flowers of sulphur, to be effectual for destroying mildew must possess the following physical and chemical properties: Fineness, uniformity of fineness, absence of clogging tendency, purity, freedom from moisture, and freedom from hygroscopic substances. In testing the comparative adaptability of the different forms, it was found that fineness is not the only consideration, as a large proportion of the sulphur

applied to vines is wasted. At the same time, with good sulphur distributing machines, the superiority of the finer grades is distinctly manifest.

In considering sulphur to be used for scale washes and sheep dips, it was found that the cheaper and, within certain limits, the coarser and less-refined article answers all the purposes of the finer and more costly form.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Index-catalogue of medical and veterinary zoology, C. W. Stiles and A. Hassall (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 39, pts. 22, pp. III+1625–1718; 23, pp. III+1719–1805*).—A continuation of the index catalogue, part 22 containing the names of authors from Paaren to Pfeilsticker, and part 23, names from Pfender to Qvortrup.

The otter in Massachusetts, C. E. Gordon (*Science, n. ser., 28 (1908), No. 726, pp. 772–775, map 1*).—An account of the occurrence in Massachusetts of the North American otter (*Lutra canadensis*).

Investigations of the department of entomology, P. J. Parrott (*New York State Sta. Rpt. 1907, pt. 3, pp. 238–266, pls. 4*).—This is a summary of the entomological investigations conducted at the New York State Station since their commencement in 1894.

The garden insects which have received particular attention are the striped cucumber beetle, squash bug, squash borer, boreal lady beetle (*Epilachna borealis*), melon louse (*Aphis gossypii*), imported cabbage worm, cabbage looper, diamond-back moth (*Plutella maculipennis*), cabbage aphis, *Thrips tabaci*, and the harlequin cabbage bug. The fruit insects studied include the codling moth, San José scale, New York plum lecanium (*Eulecanium cerasifex*), pistol case bearer, plant lice, spring canker worm, grape flea beetle, tent caterpillar, forest tent caterpillar, raspberry sawfly, apple and pear mites (*Eriophyes* spp.), and others.

The insect enemies of field crops, etc., investigated, include the army worm, cottonwood leaf beetle (*Lina scripta*), onion cutworm (*Euxoa messoria*), and poplar and willow borer (*Cryptorhynchus lapathi*).

Report of the department of botany and entomology, J. F. Nicholson (*Oklahoma Sta. Rpt. 1908, pp. 19–42*).—The principal work of the department during the fiscal year 1907–8 under report was along entomological lines.

The green bug which appeared in January, 1907, destroyed 85 per cent of the oat crop and more than 75 per cent of the wheat crop. In experiments made to determine the effectiveness of natural enemies as many as 192 green bugs were consumed by a lady beetle in one day, while the parasite *Lysephlebus tritici* was observed to deposit eggs in 30 green bugs in 11 minutes. In some localities in 1908 fully 25 per cent of the fall wheat was destroyed by the Hessian fly.

The boll weevil appeared in sufficient numbers to become injurious and the webworm was especially destructive to alfalfa. Winter plowing of cotton ground, and clean cultivation in corn is reported to have given excellent results against the bollworm. The best results, however, were obtained by planting June corn in the cotton as a trap crop.

Spraying work against the codling moth showed that fully 95 per cent of the fruit could be saved by a thorough system of spraying. The San José scale is reported to be well scattered over the State. The black locust borer is said to threaten the destruction of the locust trees of the State.

A report of the nursery inspection work is also presented, 93 nurseries having been inspected during the year.

Notes from Connecticut. W. E. Britton (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 313–315*).—The fall cankerworm (*Alsophila pometaria*) is said to have caused more damage in various portions of Connecticut than for several years, shade and woodland trees, including elm, maple, chestnut, hickory, California privet and oak as well as apple trees being fed upon. The peach sawfly (*Pamphilius persicum*) was greatly reduced in numbers by spraying with lead arsenate.

The common red spider. F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Circ. 104, pp. 11, figs. 4*).—*Tetranychus bimaculatus*, commonly known as the red spider, is a species well distributed throughout the eastern United States which attacks a wide range of plants. Several predaceous enemies including *Scymnus punctum*, *Cecidomyia coccidarum*, *Chrysopa rufilabris*, and *Thrips sexmaculata* are reported.

The following remedies are advised:

"For the greenhouse and for general use, sulphur with neutral, whale-oil, and other soap solutions; kerosene-soap emulsion; and spraying with water.

"For the treatment of trees and shrubs, the same as the above, with the addition of resin wash and the lime-sulphur and lye-sulphur mixtures.

"For truck and garden plants, lye-sulphur wash and the same remedies as for the greenhouse, with the addition of clean gardening or farming, early fall plowing, keeping down weeds, and crop rotation where practicable."

The introduction of Iridomyrmex humilis into New Orleans. E. Foster (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 289–293*).—The author discusses the probable manner and date of the introduction into this country of the Argentine ant. Since New Orleans has had no direct commercial intercourse with Argentina and cargoes of coffee have been coming from Brazil since the passage of the Compromise Act in 1833, it is considered more probable that the pest was introduced from the latter country.

[**Injurious beetles**], V. Mayet (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 50, pp. 710–716, pl. 1*).—Five species of beetles (*Cetonia speciosissima*, *C. squalida*, *C. cinctella*, *Lethrus cephalotes*, and *Lucanus parallelipipedus*) and the nature of their injury to vines are here described.

Notes on some Cecropia cocoons and parasites. J. B. Smith (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 293–297*).—Reports having come to the author in the fall and winter of 1907–8 of an unusual mortality in Cecropia cocoons, collections were made in New Jersey and on Long Island in order to determine the cause of death. Out of a total number of 1,062 cocoons examined 36 were found to be sound, adults had emerged from 34, 47 had died as pupæ, 295 were parasitized, and 650 were dead from disease. Two parasites, *Ophion macrurum* and an Ichneumonid form, were found. The hyperparasites *Spilocryptus extremis*, *Spilochalcis mariæ*, and *Dibrachys boucheanus* were reared in large numbers.

Some insects injurious to truck crops. The semitropical army worm, F. H. Chittenden and H. M. Russell (*U. S. Dept. Agr., Bur. Ent. Bul. 66, pt. 5, pp. 53–70, figs. 4*).—*Prodenia eridania* is reported as the source of considerable injury to garden truck in Florida, including tomato, potato, sweet potato, eggplant, pepper, okra, collards, and cowpeas. It feeds normally on weeds, such as the pokeweed, spiny amaranth, etc., and is confined to semitropical America as a pest. A description presented of its life history includes technical descriptions of the egg and 6 larval stages by H. G. Dyar.

"Experiments show that the egg period may be passed in a minimum of 4 days, the larval period in 17 days, and that the entire life cycle, in an outdoor summer temperature, would be about 35 days or 5 weeks; also, that there are

4 generations and possibly 5 produced in a year, the insect breeding practically continuously during the warm season."

Seven parasitic and six predaceous enemies are recorded, which are said to largely control the pests in ordinary years. A number of experiments with insecticides indicate that a spray of arsenate of lead used at the rate of 2 or 3 lbs. in 50 gals. of water, is the best remedy.

Notes on the lesser clover-leaf beetle, C. O. Houghton (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 297–300*).—*Phytonomus nigrirostris* is said to be quite common in Delaware, where with *P. punctatus* it at times does considerable damage to clover. Biological notes are given.

Factors controlling parasitism with special reference to the cotton boll weevil. W. D. Pierce (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 315–323*).—In the course of investigations made of the parasites of the boll weevil by the Bureau of Entomology of this Department the author has had opportunity to study the factors influencing parasitism in the weevils. Sixteen factors of importance are presented in addition to the eight considered by Marchal (E. S. R., 19, p. 1159).

A flea beetle attacking hops in British Columbia. H. J. Quayle (*Jour. Econ. Ent., 1 (1908), No. 5, p. 325*).—*Psylliodes punctulata* is reported to have been seriously injuring hops in British Columbia during the past year or two. The loss for 1908 in the Chilliwack and Agassiz valleys is estimated at about 80 per cent of the crop.

Some insects injurious to truck crops. The leafhoppers of the sugar beet and their relation to the "curly-leaf" condition. E. D. Ball (*U. S. Dept. Agr., Bur. Ent. Bul. 66, pt. 4, pp. 33–52, pls. 4*).—In cooperation with the Bureau of Entomology of this Department the author as entomologist of the Utah Station has investigated an affection of the sugar beet known as "curly leaf" or "blight," which occurs in the intermountain region, particularly in Utah and Colorado.

Until 1905 the condition had been supposed to be due to some fungus or bacterial disease, but in that year, when an estimated loss of a half million dollars resulted in Utah from the curly leaf, the beet leaf hopper (*Eutettix tenella*) was noticed present in large numbers.

The condition appears soon after an attack of the beet leaf hopper, a thickening of the smaller veins of the leaf taking place which gives the under surface a thickened appearance. This is followed by a curling of the edge and a final rolling up of the leaf, the upper surface always being rolled in. This results in the sending out of a large number of fibrous roots and in almost stopping the growth. In bad cases the beet shrivels and dies, while in a few instances there is a partial recovery and a new set of leaves, though the sugar content remains low.

Curly leaf appeared in cages in which beet leaf hoppers were introduced. Whether or not the condition is entirely the result of the attacks of this pest is said to be an open question. *E. tenella* is apparently a native of the southwestern part of the United States, having been collected in Colorado, New Mexico, Arizona, Utah, Idaho, California, and Oregon. Leaving hibernation, it appears in the fields about the time the beets are thinned and by the middle of June is well distributed. At Lehi, Utah, oviposition began late in June and continued until late in August, each female depositing about 80 eggs. In cage experiments the egg stage was between 13 and 15 days and the larval stage between 16 and 22 days. Nymphs that emerged from eggs the latter part of July are said to have changed to adults some 20 days later.

It is concluded that the severity of the condition is dependent upon the number of insects present, upon the time of their appearance, upon the size of

the beets, and upon the temperature of the surface soil, together with the temperature and moisture of the surrounding air. Proposed remedies include the use of kerosene emulsion (1 to 5), hopper-dozers, and other mechanical devices. Early planting and in some sections early and frequent irrigation are recommended. Seven other species of Eutettix are known to have definite food plants related to the sugar beet and several more the food plants of which are not known will probably be found to have similar habits. Brief notes are given on the species of this genus already known to occur on the beet, which, considered in order of their importance, are as follows: *E. strobi*, *E. scitula*, *E. seminuda*, *E. clarivida*, *E. insana*, and *E. stricta*. *Agallia sanguinolenta*, *A. cinerea*, *A. bigeloviæ*, *A. quadripunctata*, *A. novella*, and *Empoasca* sp. are also briefly noted.

A second kind of curly leaf, in which the leaves remain smooth but show numerous pale spots and the edges turn down, and in which the injury appears to be confined to the leaves attacked, is reported to have been found quite commonly in California. This injury appears to be due to the Empoascas.

The sugar-cane borers of Behar, M. Mackenzie and H. M. Lefroy (*Agr. Jour. India, 3 (1908), No. 2, pp. 104–124, pls. 3; Internat. Sugar Jour., 10 (1908), No. 119, pp. 540–544*).—Observations and biological data are given upon the lepidopterous borers of sugar cane. The white moth (*Scirpophaga auriflua*) and the black-spotted moth (*S. monostigma*) are described as shoot borers. The common moth borer (*Chilo simplex*), the gold-fringed moth borer (*C. auricilia*), the pink borer (*Nonagria uniformis*), and the green borer (*Anerastia ablutella*) are given as side borers, and *Polyocha saccharella* is described as a root borer.

Papers on deciduous fruit insects and insecticides. The grape-leaf skeletonizer, P. R. Jones (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 8, pp. 77–90, figs. 6*).—The author has studied *Harrisana americana* and here presents an account of its life history, including descriptions of its life stages, thus supplying many points which have been lacking.

The pest is considered a native species since it feeds upon the Virginia creeper and wild as well as domestic varieties of grapes. It appears to be widely distributed, having been reported from Canada and Mexico. Studies made at Washington, D. C., have shown that there are not 2 full generations in that vicinity. The moths from overwintering pupæ appear during the latter part of May or chiefly during the first 10 days of June. In 1908 eggs were first found on June 11, at which time a few had hatched. The average length of the egg stage was found to be 7.92 days, of the larval stage 40.5 days, of the pupal stage 14.8 days, and the life of the moth 3.5 days. The minimum length of the complete life cycle was found to be 53 days. The chalcidid *Perilampus platygaster*, a brachonid *Glyptapanteles* sp., and an ichneumon *Limneria* sp., are recorded as natural enemies. Handpicking or the application of an arsenical when the larvæ appear is recommended as a remedy.

A complete bibliography is appended.

Sawfly larvæ in apples, R. L. Webster (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 310, 311*).—Larvæ of *Taxonus nigrisoma* are reported to have been found in apples shipped from New York State.

Papers on deciduous fruit insects and insecticides. The peach-tree bark-beetle, H. F. Wilson (*U. S. Dept. Agr., Bur. Ent. Bul. 68, pt. 9, pp. 91–108, pls. 2, figs. 3*).—The Bureau of Entomology of this Department has conducted, in cooperation with the Ohio Station, an investigation of *Phlœotribis liminaris*, a pest which has become a source of considerable injury in northern Ohio.

The author here reports the results of investigations made during 1908 at Lakeside, Ohio.

The adults are said to produce the primary injury to healthy trees, the work of the larvæ being secondary. Healthy trees by repeated attacks of the adults are reduced to a condition favorable to the formation of egg burrows. When the beetles are ready to hibernate in the fall they fly to the healthy trees and form their hibernation cells. These cells are injurious to the trees, since through each cell there is a flow of sap during the following season. When the beetles come out of hibernation they bore into the bark of healthy trees from ¼ to ½ in. either for food or to form egg burrows, many small channels being thus formed in the bark. It is estimated that in some instances from 1 to 3 or more gallons of sap flows from a single tree during a season.

A description is presented of the life history of the pest. No parasites have as yet been discovered. The details of experiments with remedies are reported. It is recommended that trees severely injured be pruned back and given an application of barnyard manure or commercial fertilizer. A thick coat of whitewash should be applied 3 times during the season, the first to be made the last week in March, the second the second week in July, and the third about the first of October. Healthy trees but slightly attacked should be painted with a thick coat of whitewash 3 times each season as prescribed for severely injured ones, the applications to be made to the trunk and larger limbs. The whitewash thus applied just prior to the emergence of the beetles acts as a repellant. The addition of table salt at the rate of ¼ lb. to a pail of whitewash makes the whitewash more adhesive. It is recommended that all dead or nearly dead limbs and trees be removed as fast as they appear in the orchard, thus destroying the breeding places.

A bibliography is appended.

The orange thrips. D. Moulton (*U. S. Dept. Agr., Bur. Ent. Bul. 12, tech. ser., pt. 7, pp. 119–122, pl. 1*).—The author presents a description of *Euthrips citri*, a species new to science which has become a very important orange pest in the southern San Joaquin Valley of California. Curled and thickened leaves and scab-like markings on the oranges have been known for from 10 to 15 years, but these injuries have only recently been attributed to the thrips. While the quality of the fruit does not appear to be affected, yet as oranges are graded and sold largely on appearance, many thousands of dollars have been lost annually.

There are apparently two broods of *E. citri*. "Adults of the first brood appear just before the blossoms in February, March, and April, and a second brood appears in July, August, September, and October. Adults and larvæ of the first brood feed on the small oranges just as the petals are being thrown off, the larvæ usually under the protection of the sepals, and on the first growths of the foliage. The second brood feeds on the nearly mature oranges and on the third and fourth growths of the foliage. All varieties of oranges and lemons are attacked, but the very noticeable scabbing on the fruit is common only on the navel orange; it is less conspicuous on the Valencia." That the thrips are not so prevalent on trees planted in sedimentary or loam soils as where the soil is of a clayey or adobe texture is explained in the protection afforded by the latter soil to the larval, pupal and early adult life stages, which are presumably passed in the soil.

A strong tobacco extract and the cheaper soap washes are suggested as remedies.

The citrus whitefly of Florida consists of two species. E. W. Berger (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 324, 325*).—The author considers the citrus whitefly of Florida to represent two distinct and well-defined species.

The catalpa midge, H. A. Gossard (*Ohio Sta. Bul. 197, pp. 13, figs. 9*).—Terminal buds, leaves, and pods of the varieties of catalpa found in Ohio are said to be considerably injured by the attacks of *Cecidomyia catalpæ*. Hundreds of spots were often found on single leaves and large fruiting trees so badly attacked that from one-third to one-half of the leaves died from the injuries. The adults appear in May and in June larvæ are found in abundance on the leaves and in the terminal buds. The larvæ emerge in about 24 hours after the eggs are deposited. In midsummer from 3 to 4 weeks appear to be required for the completion of the life cycle. The larvæ are fed upon by lace wings and parasitized by the chalcid *Zatropis catalpæ*. As the larvæ drop to the ground and pupate near the surface of the soil, it is recommended that plowing be done in the late fall or early spring and that cultivation be carried on through the summer. The application of kainit beneath the trees or the drenching of the soil in early spring with kerosene emulsion (1 to 10) is also recommended.

The importation of Tetrastichus xanthomelænæ, L. O. Howard (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 281–289, fig. 1*).—The author presents an account of the biological observations made by Marchal on an egg parasite which has apparently stopped the ravages of the elm-leaf beetle in France. This parasite (*T. xanthomelænæ*) was introduced from France in April, 1908, and bred at the gipsy-moth laboratory at Melrose Highlands, Mass., by W. F. Fiske, of the Bureau of Entomology of this Department, under the author's direction. The breeding notes are here presented. Adult parasites have been liberated in two localities near Boston, Mass., at New Brunswick, N. J., and at Washington, D. C.

Notes on maple mites, P. J. Parrott (*Jour. Econ. Ent., 1 (1908), No. 5, pp. 311–313*).—Fifteen species of mites that thrive on maples have been recognized, including the two Old World species *Phyllocoptes gymnaspis* and *Oxypleurites serratus*, which are recorded for the first time in this country. Descriptions are presented of the fusiform maple gall (*P. acris-crumena* [*Eriophyes acricola*]), and the bladder maple gall (*P.* [*E. quadripes*]), the two common and widely distributed species on the hard and soft maples.

A mosquito which breeds in salt and fresh water, C. S. Banks (*Philippine Jour. Sci., B. Med. Sci., 3 (1908), No. 4, pp. 335–339, pls. 2, maps 3*).—The author reports the results of an investigation made of an epidemic of æstivo-autumnal malaria in the mountain province of Lepanto-Bontoc. Adults of *Myzomyia ludlowii* were found at Bontoc in dwellings and the larvæ, previously known to develop only in sea water, were found breeding in the greatest abundance in rivers and streams of the vicinity. The water in that region, which is strongly impregnated with lime, is said to contain a high percentage of aluminum sulphate.

While larvæ of an undetermined culicine were found associated with those of *M. ludlowii* no other species of Anophelinæ was found. This is considered the first record of a species of mosquito developing naturally in both salt and fresh water.

The author concludes that altitude (up to 1,500 meters) has no appreciable influence upon the development of *M. ludlowii* and that there is little hope of ridding a community like Cervantes of this insect owing to the peculiar topographical features.

Mosquito comment, C. S. Ludlow (*Canad. Ent., 41 (1909), No. 1, pp. 21–24*).—The genus Calvertia, *Anopheles formosus*, and *Pseudoranolænia parangensis*, two species from the Philippines, are described as new.

The house mosquito, a city, town, and village problem, J. B. Smith (*New Jersey Stas. Bul. 216, pp. 3–21, pls. 2, figs. 7*).—The work done on the salt marshes of New Jersey since 1904 is said to have practically eliminated the

migratory species of mosquitoes from consideration. During the summer of 1908, the house mosquito (*Culex pipiens*) was present in the cities in great numbers. The author describes the life history and habits of this species and the many usual and unusual places in which it breeds. As many female mosquitoes pass the winter in cellars, it is recommended that such places be fumigated either with a mixture of equal parts of carbolic acid crystals and gum camphor or with Jimpson weed. In a municipal campaign all standing water should be located and removed by filling or draining. The standing water in sewer catch basins should be oiled frequently.

Remedies for the San José scale, E. P. TAYLOR (*Missouri Fruit Sta. Circ. 3, pp. 4*).—This circular contains formulas, methods of preparation, and directions for the use of standard and commercial lime-sulphur wash, oil emulsion, and miscible oil sprays.

Homemade soluble oils for use against the San José scale, J. L. PHILLIPS (*Virginia Sta. Bul. 179, pp. 78–88*).—The following conclusions have been drawn by the author from cooperative orchard tests:

"Homemade soluble oils are recommended for trial in place of the lime-sulphur wash, under certain conditions. Further tests must be made before we can recommend them unreservedly. For general orchard spraying the lime-sulphur is probably more satisfactory.

"The various prepared or patented brands of soluble oils cost about three times as much as the homemade product containing the same percentage of oil. Our tests indicate that the homemade oil is as effective as the prepared oil. The cost of the homemade oil is about the same as the cost of lime-sulphur.

"The homemade soluble oil is more practicable for the commercial orchardist than for the man who has only a few trees, unless one person will make the material for a neighborhood.

"It is not quite as troublesome and disagreeable to make soluble oil at home as it is to make lime-sulphur.

"Apply the soluble oil spray only in the dormant season. The trees should not be pruned before they are sprayed, as the oil may injure the cut surfaces, unless they are painted.

"The homemade soluble oil spray is recommended for trial against the San José scale, and the maple scale. It is not recommended for use against the scurfy scale."

Cooperative [spraying] experiments, L. R. TAFT (*Michigan Sta. Rpt. 1908, pp. 153–157*).—The author here discusses the general conclusions arrived at as the result of spraying experiments with insecticides and fungicides.

Spray calendar, C. E. SANBORN (*Texas Sta. Bul. 113, pp. 5–10, pl. 1*).—Spraying machinery, and formulas for, preparation, and use of insecticides and fungicides are briefly considered.

Spraying calendar, L. R. TAFT and R. S. SHAW (*Michigan Sta. Spec. Bul. 45, folio*).—In this wall calendar, directions are given for the preparation and application of insecticides and fungicides.

Homemade oil emulsion, E. P. TAYLOR (*Missouri Fruit Sta. Circ. 4, pp. 3*).—Directions for the preparation and use of kerosene emulsion.

Analysis of Paris green and other insecticides, L. L. VAN SLYKE (*New York State Sta. Rpt. 1907, pt. 3, pp. 225–227*).—This is a historical review of the legislation in New York relative to insecticides, including the main provisions of the present law, and a brief summary of the work of the New York State Station in the analysis of insecticides. During the years 1899 to 1902, 130 samples of Paris green were analyzed, the amount of arsenious oxid varying from 55.34 to 62.87 per cent, the copper oxid from 26.53 to 31.2 per cent, the arsenious oxid in combination with copper from 49.70 to 58.45 per cent, and the water

soluble arsenic from 0.61 to 2.24 per cent. Analyses of several proprietary insecticides and of Paris green-Bordeaux mixture are appended.

The danger in the use of arsenicals as insecticides, MESTREZAT (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 9, pp. 393–397*).—After considering the results of analyses the author concludes that there is comparatively little danger from the use in viticulture of arsenical insecticides either in their application or in the consumption of the wine. The real and sole danger is in their simultaneous storage with other substances frequently used in agriculture, which resemble them so closely that they are easily mistaken.

Miscellaneous papers on apiculture. A brief survey of Hawaiian bee keeping. E. F. PHILLIPS (*U. S. Dept. Agr., Bur. Ent. Bul. 75, pt. 5, pp. 43–58, pls. 6*).—The author here reports an investigation made of the bee keeping industry in the Hawaiian Islands. While it is stated that the business can never become a leading industry it is believed that there is room for considerable expansion. An active and efficient bee keepers' association is said to have been in existence for 2 years. At the present time bee keeping is largely in the hands of 4 corporations, they owning and operating at least four-fifths of all the bees on the islands.

The number of colonies is estimated at 20,000 and the output of honey for 1908 as 1,000 tons. Most of the honey is shipped to the mainland or Europe. A list of honey plants furnished by D. L. Van Dine is presented. The introduced algeroba tree (*Prosopis juliflora*), which is the same or closely related to the mesquite of the Southwest is said to be one of the most important.

Two-thirds of the honey shipped annually from the islands is largely or entirely honeydew honey (E. S. R., 19, p. 1059; 20, p. 261). The greater part of this comes from the exudation of the sugar-cane leaf-hopper (*Perkinsiella saccharicida*), but possibly some of it from the sugar-cane aphis (*Aphis sacchari*).

As Hawaiian honey sells for low prices the bee keepers of the islands are desirous of producing wax instead. A method suggested by the author is described whereby wax secretion is stimulated by shaking the colonies on starters of foundation, the manipulation being identical with the shaking in treating for bee disease.

Careful examinations were made of apiaries in the islands but no trace of disease was found. Regulations have recently been passed which place restrictions on the importation of honey bees and honey.

Miscellaneous papers on apiculture. The status of apiculture in the United States. E. F. PHILLIPS (*U. S. Dept. Agr., Bur. Ent. Bul. 75, pt. 6, pp. 59–80*).—A discussion of the subject in which the notable growth of apiculture during the past half century is pointed out. It is stated that there are in the United States over 700,000 bee keepers producing annually $20,000,000 worth of honey and $2,000,000 worth of beeswax, and that the annual importation of honey amounts to about 2,500,000 lbs., and that of wax to about 700,000 lbs. Other topics discussed include the importance to American agriculture of the honey bee as a pollenizing agent, the present sources of loss in bee keeping due to swarming, winter losses, enemies, disease and waste of wax and nectar, and the need of further investigations in apiculture.

FOODS—HUMAN NUTRITION.

Thirteenth report on food products for 1908. J. P. STREET ET AL. (*Connecticut State Sta. Rpt. 1907–8, pt. 9, pp. 573–716*).—During the past year 625 samples collected by the station were examined, including among others arrowroot starch, cornstarch, diabetic preparations, ginger, infant and invalid foods, jams,

preserves and similar goods, meat extracts, meat juices and other preparations, yeast extracts, sirups, table salt, ammonia, and drugs. Of these samples 225 were found to be adulterated or below standard and 69 were compound. Of 771 samples collected by the dairy commissioner, including among other things spices, butter and butter substitutes, chocolate and cocoa, maple sirup, molasses, olive oil, vinegar and drugs, 233 were adulterated or below standard and 26 compound.

The part of the investigation which has to do with meat extracts and similar goods and yeast extracts constitutes an exhaustive study of such products and includes data on the manufacture, chemical composition and food value, as well as on the status of such products under the provisions of the pure food law. A bibliography is appended. In general, the comparative value of meat extract "is shown by determinations of water, total ash and its chief constituents, total nitrogen, and the meat bases. These data show the concentration of the extract, the amount and nature of its ash, and the proportion of true meat extractives which it contains. There are a number of preparations on the market sold as meat extracts, which are prepared wholly from yeast. These resemble meat extracts in taste and appearance, but show marked chemical differences. The important extractives, creatinin and creatin, are absent; on the other hand, the purin bases are comparatively abundant. The amount of creatinin and creatin found is, therefore, a valuable guide as to the source of an extract."

The data reported showed that certain of the meat extracts examined "satisfy the legal standards in all particulars, some are deficient in one or more respects, while others, because of false statements concerning them, must be considered as misbranded."

The physiological effects and nutritive value of meat extracts, as indicated by their chemical composition are discussed.

"The true value of a meat extract depends almost entirely upon the salts and extractives which it contains and upon its flavor.

"The characteristic salts of true meat extracts are potassium dihydrogen phosphate and potassium monohydrogen phosphate, the former predominating. Potassium chlorid is also present in considerable amount. . . .

"[The extractives] may be classed as nitrogenous and nonnitrogenous. . . . Most of [the nitrogenous extractives] are basic in character, some are amids, and all are classed under the somewhat loose term 'meat bases.' The most important physiologically are creatin, its anhydrid, creatinin, and the xanthin or purin bases. The purin bases most commonly found are xanthin, hypoxanthin, adenin and carnin.

"The nonnitrogenous extractive matters, in addition to the salts already considered, consist chiefly of lactic acid, lactates, and glycogen. Little is known as to the actual amounts of these ingredients present.

"Glycerol, glucose, and milk sugar are occasionally found in the extracts and must be considered as adulterants; preservatives are also sometimes employed, especially in fluid extracts."

The fluid meat extracts were found to contain on an average considerably more water than the paste-like goods, the other constituents being similar in character but lower in proportion. The meat powders examined contained less water and a larger amount of salt and other substances, the different brands showing considerable variation in composition owing to differences in the processes followed in their manufacture. When composed chiefly of ground meat they naturally resemble water-free meat in composition. It is claimed that sometimes blood is incorporated in these substances, and this would have an effect on composition and nutritive value.

"Ordinary meat contains about 25 per cent of solid matter; if all of the water were removed the residue would contain about 87 per cent of proteids and albuminoids, 8 per cent of extractives, and about 5 per cent of ash. This more or less complete removal of water is the practice followed in the preparation of meat powders. In some preparations, not only is the greater part of the water removed, but the proteid matter is treated by an appropriate ferment and a predigested or peptonized product results. Unlike meat extracts, meat powders, if properly prepared, are highly nutritious, and are the only means of securing the full nutritive value of meat in small bulk. Certain authorities have maintained that they are difficult of digestion, but later experiments have controverted this position, and they are now quite generally recommended as being readily digested and assimilated."

The proprietary meat articles, meat capsules, yeast extracts, and the other goods examined are also discussed.

Influence of food preservatives and artificial colors on digestion and health. V, Formaldehyde, H. W. WILEY, W. D. BIGELOW, F. C. WEBER, ET AL. (*U. S. Dept. Agr., Bur. Chem. Bul. 84, pt. 5, pp. VI+1295–1500, figs. 4*).—In continuation of work previously noted (E. S. R., 20, p. 464), similar experiments with healthy young men as subjects were undertaken to judge of the effects of formaldehyde on normal human beings.

Formaldehyde, as the author points out, "is one of those preservatives the use of which in foods has been almost universally condemned by experts, physicians, and the general public. Nevertheless, as formaldehyde has heretofore been used to quite an extent in certain foods, especially dairy products, and is still advertised under its own and other names for use in such products to a limited extent, it seemed wise to include this substance in the plan of investigation."

In the periods in which formaldehyde was added to the ration an aqueous solution was administered in milk. In the case of half of the subjects the preservative was added to the milk immediately before it was drunk, while with the other 6 subjects it was added to the milk 2 days before consumption in order that ample time might be given for any chemical union taking place between the formaldehyde and the protein constituents of the milk.

In the discussion of the experimental data such subjects as body weight, weight and water content of the feces, the urine, its volume, and the metabolism of nitrogen, phosphoric acid, and sulphur are considered. Quotations follow from the author's summary.

"The formaldehyde in the quantities administered did not produce any marked symptoms until the third preservative subperiod, a lapse of 10 days; then headache and pain in the stomach and intestines became general, in many cases producing cramps, and in a few cases attended by nausea and vomiting. Only two exceptions are noted. A burning sensation in the throat was reported in the majority of cases. In four cases out of eleven a well marked itching rash appeared on the chest and thighs, causing great discomfort, slight symptoms of this nature being reported in a fifth case. The general symptoms, therefore, are headache and abdominal pains, while a slight tendency to lower the temperature may be noted as a minor symptom, and the development of the rash, though marked, occurs in only about half of the cases.

"It is important to observe that in the case of healthy young men it requires some time for this drug to produce an effect noticeable in a symptomatic way, as above described. That no effect is produced, however, until after 10 days would not be a logical conclusion. It is evident that the system is able for some time to control the development of conditions which later become

pronounced, but that no ill effects are produced prior to that time is not probable. . . .

"A general study of all of the data leads to the conclusion that the admixture of formaldehyde with food is injurious to health, even in the case of healthy young men. It is fair to conclude, therefore, that in the case of infants and children the deleterious effects would be more pronounced. The metabolic functions are disturbed in a notable way, both by the retardation of the nitrogen and sulphur metabolism and the acceleration of phosphorus metabolism. There seems to be a tendency to an increased absorption from the alimentary canal, especially in the cases when the formaldehyde had stood in contact with the milk, and hence it is fair to presume that in so far as the digestive action in the intestinal canal is concerned, transforming solid food into soluble materials which may enter the circulation, there is evidently a stimulating effect produced.

"There are, however, many varying conditions which must be considered in properly interpreting the data. The uniformly increased absorption of the proteid elements of the food, and also of the sulphur and phosphoric acid, accompanied in the first two instances by a decrease in the metabolized elements excreted, and in the last instance, namely, phosphoric acid, by a pronounced increase in metabolism, makes the explanation of the data rather difficult. . . .

"The conditions which are noted in the case of the proteins would lead one to expect a gain in the body weight. This expectation, however, is not realized for either class of subjects, although the losses in weight are so slight as to be practically negligible. . . .

"The medical data indicate plainly that formaldehyde, even when given in small quantities, is an irritating substance to the mucous membrane, and therefore the normal organs are at first actively stimulated to rid themselves of the irritating foreign substance. It is not strange, therefore, that this preservative had a marked stimulative action on those organs and cells secreting the various digestive juices. It is evident that when the digestive and excretory organs of the body are excited to unusual activity by such an extraneous body having neither food nor condimental value, they act in self-defense, and it would be wholly illogical to conclude from this increased excitation that these bodies were helpful to digestion and conducive to health. The nature of the investigation made it impossible to determine whether any organic change took place in the various organs affected, but it may be assumed that any such change which these organs had undergone in the limited time was not sufficient to disturb in any notable way their normal functions, which they would perform until the continued administration of the drug produced disease due to the excessive stimulation.

"In the case of phosphoric acid, the increased katabolic activity is difficult of definite interpretation, though it is established beyond doubt that such an effect is produced. . . .

"The general tendency to produce a slight decrease in the temperature of the body, assuming for the moment that the data warrant the conclusions that such a condition of affairs existed, might well be due to the inhibition of cell activity shown by the retardation in the breaking down of tissues. The normal functions of the body would doubtless be disturbed by such a condition, aside from the irritating and other disturbing influences exerted by the ingested drug.

"The tendency of the preservative to produce albumin in the urine, while not well marked, is at least worthy of mention. The fact that only slight changes take place in the body weight is sufficiently explained by the data and can not be urged in favor of the exhibited preservative.

"The final conclusion, therefore, is that the addition of formaldehyde to foods tends to derange metabolism, disturb the normal functions, and produce irritation and undue stimulation of the secretory activities, and therefore it is never justifiable."

General results of the investigations showing the effect of formaldehyde upon digestion and health (*U. S. Dept. Agr., Bur. Chem. Circ. 42, pp. 16, figs. 4.*)—A general summary and discussion of investigations noted above.

A study of the methods of canning meats, with reference to the proper disposal of defective cans, C. N. McBryde (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 279–296, fig. 1*).—From an extended study of defective cans of meat goods the following conclusions were drawn:

"The majority of slow-leaking cans contain bacteria, which invariably set up putrefactive or fermentative changes in the contents of the cans.

"The majority of slow-leaking cans, when incubated for 10 days at a temperature of 100 to 110° F., will develop into 'swellers.'

"Short-vacuum, overstuffed, and collapsed cans will not swell upon incubation provided there are no breaks in the tins.

"The swelling of slow-leaking cans upon incubation is due to the formation of gases resulting from the growth of bacteria within the cans.

"The product contained in slow-leaking cans is not a safe article for food even though it be reprocessed."

Report of a commission on certain features of the Federal meat inspection regulations (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 361–374*).—A report of a committee appointed by the Secretary of Agriculture to express opinion upon "the disposition of carcasses affected with various diseases and abnormal conditions." In general, the commission considers that the regulation on this subject already in force fully safeguards the public health in so far as the points contained therein are concerned.

The quantity and distribution of phosphorus in certain foods, W. Heubner and M. Reeb (*Arch. Expt. Path. u. Pharmakol., 1908, Sup., pp. 265–272*).—The authors report and discuss determinations of the total phosphorus and its distribution in a number of food materials.

The analytical results are summarized in the following table:

Kind and amount of phosphorus in certain food materials.

Kind of food.	Total phosphorus.	Form of phosphorus.			
		Phosphatid.	Soluble phosphate.	Water soluble phosphate.	Nuclein and proteid phosphorus.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Horse flesh	0.192	0.039	0.114	0.010	0.026
Milk	.106	.006	.032	.006	.057
Egg white	.015	.....	.003	.003	.009
Bread	.098	.007	.035	.....	.049
Rice	.097	.004	.004	.....	.088
Bran	1.452	.020	.217	.346	.662
Carrots	.054	.004	.027	.015	.005
Beets	.028	.006	.012	.007	.003
Kale	.058	.009	.027	[a].011	.012
White cabbage	.026	.005	.012	[a].006	.003

[a] Estimated.

The bacterial content of cooked fish. H. BRUNS (*Über das bakteriologische Verhalten des Fischfleisches nach der Zubereitung. Inaug. Diss., Univ. München, 1908, pp. 29; Arch. Hyg., 67 (1908), No. 3, pp. 209–236*).—The author studied the bacterial content of the surface and interior of raw fish and fish cooked and kept in different ways. According to the results which he obtained, the interior of the flesh and the surface of freshly cooked material are free from bacteria and remain so for some days provided the fish is properly handled and stored, as for instance by wrapping the fish in sterile paper and keeping at suitable temperature. It was also found that cooked fish imbedded in jelly remained free from bacteria for a number of days.

Edible fishes of New South Wales. D. G. STEAD (*Dept. Fisheries, N. S. Wales: 1908, pp. 123, pls. 81, map 1*).—A list of edible fishes of New South Wales is given, together with brief statements regarding each species. In the introductory chapter statistics are given of the character and extent of the New South Wales fishing industry.

Edible seaweed. H. E. ANNETT, F. V. DARBISHIRE, and E. J. RUSSELL (*Jour. Southeast. Agr. Col. Wye, 1907, No. 16, pp. 204, 205*).—An analysis of edible seaweed (a mixture of *Chondrus crispus* and *Gigartina mamillosa*) is reported and some data are quoted on the use of a jelly made from Irish moss (*Chondrus crispus*) with milk in calf feeding.

The water content of bread. O. MEZGER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 7, pp. 395–397*).—Analyses of both white and black bread are reported and discussed.

The behavior of ester compounds in the aging of wine. F. SCURTI and G. CORSO (*Staz. Sper. Agr. Ital., 41 (1908), No. 8, pp. 507–519; abs. in Chem. Zentbl., 1908, II, No. 19, p. 1622*).—The author does not believe in the theory that the total amount of esters in wine increases on aging. The article contains a critical discussion of methods.

Judging alcohol-free wine. J. M. KRASSER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 7, pp. 398–400*).—The author believes that the term "alcohol-free wine" should only be applied to such products as are made by removing alcohol from natural wines and that sterilized fruit juices should be designated as such and not called "alcohol-free wine." Analyses of so-called "alcohol-free wines" are reported.

Report on the physical, commercial, social and general conditions of Ichang and neighborhood. H. A. LITTLE (*Diplo. and Cons. Rpts. [London], Misc. Ser., 1908, No. 671, pp. 24, map 1*).—In addition to statistical and other data regarding schools, salaries and wages, land tenure, agriculture, fertilizers, the flora of the district, etc., this report contains considerable information regarding the character and cost of the food of Chinese laboring men.

[Diet in a reformatory for inebriates] (*Illus. London News [Amer. Ed.], 43 (1908), No. 1124, pp. 736, 737, figs. 13*).—In an article descriptive of the State Inebriates Reformatory at Aylesbury, a reformatory institution for women, data are given regarding the kind and amount of food supplied per woman per day.

The daily fare consists of white bread, butter, potatoes, meat, a green vegetable, a simple dessert, cereal porridge, tea, and cocoa. [From the quantities given the nutrients supplied per woman per day were calculated to be 115 gm. protein, 96 gm. fat, and 497 gm. carbohydrates, which would yield together 3,310 calories of available energy.]

Proposed ration for the agricultural school of Chile (*An. Agron. [Santiago de Chile], 2 (1907), No. 3, p. 283*).—The proposed ration per man per day consists of 250 gm. meat, 500 gm. bread, 56 gm. sugar, 200 gm. frejoles, 600 gm. navy beans, 25 gm. rice, 15 gm. fat, 150 gm. milk, 10 gm. coffee, with salad and

green vegetables. This ration would supply in round numbers 142 gm. protein, 52 gm. fat, 556 gm. carbohydrates, and 25 gm. ash, and 3,232 calories of available energy at a cost of 66 cents Chilean.

Ration for the technical school, J. FIGUEROA (*Bol. Min. Indus. i Obras Pub. [Chile]*, 7 (*1908*), *No. 1, p. 8*).—The ration proposed for the government technical school and its divisions is given. (See above.)

School luncheons. How and what to prepare for them, MRS. F. SCHOFF (*Nat. Cong. Mothers Mag., 3 (1908), No. 3, pp. 81–83*).—A discussion on preparing and packing school lunches and related matters.

The new housekeeping, C. BARNARD (*Housekeeping Expt. Sta. [Conn.] Bul. 4, pp. 4*).—A discussion of the use of alcohol as fuel and of preparing food with steam cookers and fireless cookers.

The importance of intestinal bacteria in nutrition, III, M. SCHOTTELIUS (*Arch. Hyg. 67 (1908), No. 3, pp. 177–208*).—The author concludes that intestinal bacteria are necessary for man and other vertebrates, and that normal intestinal bacteria assist in the preparation of nutrients so that they may be resorbed, induce peristalsis by stimulating the intestinal wall, diminish or destroy pathogenic bacteria in the intestine, and protect the body from bacterial poisons.

The absorption of proteins, W. D. HALLIBURTON (*Lancet [London], 1909, I, No. 1, pp. 21–23*).—A polemical article in which the author briefly summarizes present theories regarding protein cleavage in the body and metabolism.

The effect of adding meat to a vegetarian diet, P. ALBERTONI and F. ROSSI (*Arch. Expl. Path. u. Pharmakol., 1908, Sup., pp. 29–38*).—The authors briefly report the results of a series of investigations on the addition of meat to the diet of peasants of the Abruzzi region who have been users of an almost exclusively vegetarian diet for generations.

An increase in the power of assimilation and in body weight was noted as well as in physical strength and the hemoglobin content of the blood. Attention is directed especially to the increase in red blood corpuscles, a result which is similar to that observed in the treatment of anemia and underdeveloped individuals.

In discussing the results of their investigations in relation to the question of nitrogen minimum, the authors state that the distinction must be clearly drawn between a nitrogen minimum estimated on the basis of the balance of income and outgo and the practical minimum which enables the individual to carry on all the psychological and physical processes which are essential if he is to succeed in his environment.

Concerning the effect of maize diet, C. BEZZOLA (*Clin. Med. Ital., 46 (1907), No. 3, pp. 161–164; abs. in Biochem. Centbl., 7 (1908): No. 18–19, p. 699*).—In experiments with guinea pigs an exclusive maize diet did not prove adequate. When vegetables, etc., were added, better results were obtained. Long continued feeding of maize may be followed by serious consequences. Results were of the same character whether a good or bad quality of maize was used. The author does not consider that his results are applicable to the discussion of maize as an article of human food.

On the available alkali in the ash of human and cow's milk in its relation to infant nutrition, J. H. KASTLE (*Amer. Jour. Physiol., 22 (1908), No. 2, pp. 284–308*).—The essential points of resemblance and difference in the composition and properties of the ash of human and cow's milk are discussed in their relations to infant nutrition.

"In 35 out of 50 specimens of cow's milk, in which the alkalinity of the ash was determined, it ranged from 0.1193 cc. of tenth-normal sodium hydroxid to

0.1788 cc., the average being 0.1574 cc., and in 18 out of 26 specimens of human milk, in which the alkalinity of the ash was determined, it ranged from 0.1196 to 0.1799 cc. of tenth-normal sodium hydroxid, the average being 0.1513 cc., which numbers agree reasonably well with the average alkalinity of the ash of the two kinds of milk calculated from the complete analyses.

"It is evident, therefore, that while cow's milk contains from 2.5 to 3.5 times as much mineral matter as human milk, the ash of the two milks contains approximately the same amount of available alkali. . . . The salient points of difference between the two kinds of milk are: Human milk contains relatively more of its mineral matter in utilizable form than cow's milk; it can supply the organism of the child with relatively larger amounts of available alkali in proportion to the proteid than cow's milk; it contains much less proteid; and it contains a more readily absorbable variety of fat. . . . It is believed, therefore, that while the primary cause of gastro-intestinal disturbances following the use of cow's milk in infant feeding is due to the fact that the fat is not readily absorbed, the more remote and fundamental cause of these disorders in infants fed upon rich cow's milk is an excessive proteid metabolism and an insufficiency in available mineral matter in cow's milk as compared with human milk. . . . Some of the most valuable recommendations and practices relating to infant feeding, such as the feeding of skim milk and buttermilk, the addition of certain alkaline substances to the diet such as citrates, the dilution of cow's milk with barley broth, etc., or with water containing the white of egg as recommended by Lehmann, and the use of such substances as orange juice, as adjuncts to the infant diet, are in accord with the ideas herein set forth. Practically all of these aids to artificial infant feeding, based as they are upon the results of sound practical experience, have for their object either the reduction of the amount of fat in the milk or the addition thereto of mineral matter available for the neutralization of acids resulting from metabolism, or both. In this connection it is interesting to note that the ash of white of egg and orange juice both contain considerably more available alkali than cow's milk."

Tables of the alkalinity and the ash contents of milk are given.

Nutrition processes during the growth of the child, M. Rubner (*Arch. Hyg., 66 (1908), No. 1–2, pp. 81–126*).—In this theoretical discussion of diet during the period of growth the author emphasizes the importance of energy considerations and gives reasons for his belief that the proteid requirement has been sometimes overestimated. The article is a very important contribution to the theory of infant feeding.

Theory of nutrition after completion of growth, M. Rubner (*Arch. Hyg., 66 (1908), No. 1–2, pp. 1–80*).—This discussion of theories of nutrition is chiefly concerned with protein metabolism, and considers the functions of body protein, stored protein, protein as building material and protein as a source of energy, and related topics. Protein metabolism, the author states, varies according to the protein requirements of the cell, the cell with little protein retaining more of the protein supplied to it than one which is rich in this constituent. For this reason a large protein supply does not cause so great nitrogen excretion in the former case as in the latter.

The author discusses nitrogen metabolism and gain on a basis of the amount of nitrogen present in the body rather than on the usual basis of body weight. Cell function is the primary consideration in protein metabolism. The cleavage of protein accommodates itself to this factor, and there is a relationship between cell function and the size of the body. Within certain limits nitrogen metabolism is more rapid the more protein is supplied.

An excess of protein leads to a partial use of it to replace carbohydrates as a source of energy. In such cases the nutritive value is relatively less than when smaller amounts are supplied.

Problems of growth and length of life from the standpoint of energetics. M. RUBNER (*Arch. Hyg., 66 (1908), No. 1–2, pp. 127–208, charts 2; Sitzber. K. Preuss. Akad. Wiss., 1908, II, pp. 32–47*).—The author discusses rate of growth and duration of life of man and other mammals from the standpoint of energetics. With respect both to the amount of protein and energy required during the nursing period to double the body weight, man forms an exception to the other mammals included in the author's discussion in that on a uniform basis of comparison he requires smaller quantities of protein and about six times as much energy. According to the author's calculations, domestic mammals require on an average 4,808 calories for building a kilogram of body material.

A comparison is also made between man and other mammals with respect to the proportion of energy supplied during the nursing period, which is retained in the body. In this respect also man differs from the ordinary domestic animals, since he retains only 5.2 per cent of the net energy supplied in comparison with 34.3 in the case of domestic animals. This value is called by the author "quotient of growth." He estimates further that in domestic animals the ratio of food supply to maintenance is 202 to 100 and in man 120 to 100, so that in the case of domestic animals 69 per cent of the material supplied is retained in comparison with 6.2 per cent in the case of man.

According to the author's summary, the time required by the young animal for doubling the body weight is inversely proportional to the intensity of metabolism, and therefore the shorter the period of growth the greater the metabolism of energy. The intensity of energy metabolism is a function of surface area and therefore small animals show the more rapid growth.

In his discussion of the duration of life the author estimates that in the domestic animals each kilogram of body weight after growth is completed requires practically the same quantity of energy. Man forms an exception to this rule, in that he requires about four times as much as the other mammals. It follows, therefore, that man requires a greater proportional energy supply than other mammals.

The problem of duration of life and its relation to growth and nutrition. M. RUBNER (*Das Problem der Lebensdauer und seine Beziehungen zu Wachstum und Ernährung. München, 1908, pp. VIII+208; rev. in Biochem. Centbl., 7 (1908), No. 15–16, pp. 593, 594*).—A fuller discussion of problems considered in the article noted above.

ANIMAL PRODUCTION.

[Experiments in animal production]. W. H. JORDAN and W. P. WHEELER (*New York State Sta. Rpt. 1907, pt. 3, pp. 66–109, pls. 2*).—A summary of work done at this station during the first 25 years of its existence.

Some of the more important results obtained are as follows: Corn cut on September 29 contained a large increase in carbohydrate material over that cut September 11. From a number of experiments it was concluded that the German feeding standard called for a larger protein ration than is necessary. In 1901 it was demonstrated that the quality of the milk is determined by the individuality of the animal and not by the quality of the feed. It was also found that it was not possible to influence the amount of water in cow's milk through either the drinking water or watery food. Wet brewers' grains proved to be a valuable feed when given in the right proportions. Carbohydrates in the feed were found to furnish the raw material for the production of a large

proportion of the fat in the milk. The carcass of a corn-fed lamb contained a much larger proportion of fat than the carcass of a lamb fed upon cotton-seed meal.

Specific gravity methods for determining freshness of eggs were found unreliable. Small active breeds of poultry do better with a wide ration than large breeds. Hens fed linseed meal molted rapidly and earlier in the season than those receiving a large amount of tallow. Oyster shells were found to be utilized largely in the construction of the eggshell. Cockerels were found the most profitable when sold at about 6 lbs. weight, and capons when fed until about 9 lbs. in weight. Eleven per cent more eggs were obtained from hens when kept in pens without cockerels. From a number of experiments it was found that with growing stock ground grain gave on the whole better results than whole grain. Rations containing animal food were superior to those of vegetable origin for growing chicks, laying hens, and ducklings.

Of a number of coarse feeds fed to swine none were eaten without waste except mangels. With fresh forage crops better gains were made when salt was added to the ration. Corn silage, red clover, and sorghum proved to be good feeds when given in small amounts.

The computation of rations for farm animals by the use of energy values, H. P. Armsby (*U. S. Dept. Agr., Farmers' Bul. 346, pp. 32*).—The feed requirements for maintenance, growth, fattening, milk production, and work are treated in this bulletin from the standard of energy values instead of the balanced-ration method commonly used in popular works on feeding. The method for computing rations is presented in such form that it is intelligible to the practical farmer, though based on fundamental principles as revealed by scientific investigations.

Feeds and feeding, W. A. Henry, trans. by F. M. Draenert (*Forragem e Nutrição. São Paulo, 1907, pp. XIV+700*).—A Portuguese translation of this work (E. S. R., 10, p. 82).

Concentrated commercial feeding stuffs, W. J. Jones, O. C. Haworth, and J. B. Abbott (*Indiana Sta. Bul. 131, pp. 305–465*).—This bulletin contains the text of the Indiana feeding stuff law of 1907 and a discussion thereof, together with the results of analyses of 1,361 samples of feeding stuffs, including wheat bran and middlings, red-dog flour, mixed feeds, rye products, buckwheat bran and middlings, corn bran, hominy meal and chops, gluten feed, linseed meal, flax screenings, cotton-seed meal, dried brewers' grains, malt sprouts, proprietary and molasses feeds, poultry and scratch feeds, animal meals, and condimental stock feeds. There is also a list of brands and guaranties registered by manufacturers in compliance with the law.

"Since very few manufacturers had ever had their products analyzed it was to be expected that many would make their guaranties too high. In the majority of cases the guaranty was based on the average analysis of the products as given in Circular No. 7 published by this station [E. S. R., 19, p. 67], and while a large number of samples failed to meet the guaranty, and there is much room for improvement in the character of the feeding stuffs offered for sale, a decided increase in the number of samples meeting the guaranty is noted in those now being secured and in the case of many others the guaranty has been lowered to meet the inspection analysis."

The value of fodder plants at different stages of maturity and the proper time for harvesting the same, J. König and A. Fürstenberg (*Zentbl. Agr. Chem., 37 (1908), No. 11, pp. 745–749*).—Analyses were made of grass and of clover hays cut before, after, and at the time of blossoming. The results agreed with practical experience that hay should be cut when in blossom.

Tropical fodder plants, A. ZIMMERMANN (*Pflanzer, 4 (1908), Nos. 15, pp. 225–230; 16, pp. 250–256; 17, pp. 269, 270; 18, pp. 273–281; 19, pp. 300–303*).—Descriptions of grasses and other plants used for forage in the Tropics.

"Top feed" in Murchison and Gascoyne districts (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 4, p. 753*).—Results of analyses of a sample of Wanyoo bush or "Sugar Brother" and of a broad-leaf wattle.

Defecation with a view to cattle feeding (*Sugar Beet, 30 (1909), No. 1, pp. 36, 37*).—This is an account of an old method which has recently been revived in Austria for use where the beets are to be fed to cattle. The beets are rasped, defecated with lime, and pressed. The pulp obtained has a higher nutritive value than that otherwise obtained, being drier and the sugar losses less than in diffusion pulps. The juices obtained are denser, and there follows also an economy of steam owing to the fact that the diffusion battery is done away with. The cost of the plant and its working is much less than with diffusion.

Digestibility of kale, vetch hay, steamed and unsteamed silage, J. WITHYCOMBE and C. E. BRADLEY (*Oregon Sta. Bul. 102, pp. 3–29, fig. 1*).—This bulletin reports 2 digestion experiments on fresh kale and 1 each on vetch hay, unsteamed corn silage, steamed corn silage, unsteamed vetch silage, and steamed vetch silage. Each experiment continued 7 days, in addition to a few days of preliminary feeding. The animals used were 2 dry cows, 1 a pure-bred Jersey and the other a Jersey-Shorthorn cross.

Chemical analysis showed the kale to be rich in protein, averaging about 2.5 per cent on the fresh sample and 21 per cent on the dry substance. The ash content was high, being 8.58 per cent in the stalks and 14.7 per cent in the leaves of the total dry matter. "Calculated to the acre yield of 30 tons, these values show that approximately 225 lbs. of potash and 115 lbs. of phosphoric acid enter into the composition of each acre of kale. This shows the plant to be a heavy feeder on these plant foods and proves the necessity of a rich soil for its successful growth." Analytical data on the other feeds are reported. Both cows lost in weight in each experiment except in the vetch hay and the unsteamed vetch silage periods.

Determinations were made of the energy values of the food and feces but not of the urine.

The following table shows the percentage of digestible nutrients and available energy of the different feeds:

Coefficients of digestible nutrients and available energy of kale, vetch hay, and silage.

Kind of feed.	Dry matter.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Ash.	Available energy.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Kale	68.01	80.63	58.99	75.83	65.85	38.81	71.76
Vetch hay	64.56	61.07	58.22	70.71	68.01	58.98	63.08
Unsteamed corn silage	63.24	56.38	62.94	66.85	77.34	47.28	76.70
Steamed corn silage	51.16	14.62	51.46	62.83	62.91	37.71	61.75
Unsteamed vetch silage	71.85	58.55	73.55	74.90	89.71	42.58	62.71
Steamed vetch silage	60.68	5.30	63.26	71.12	79.27	9.01	48.79

Experiments on the digestibility of prickly pear by cattle, R. F. HARE (*New Mexico Sta. Bul. 69, pp. 5–8, figs. 3*).—Noted from another source (E. S. R., 20, p. 171).

Steer feeding. II, Winter steer feeding, 1906–7, 1907–8, J. H. SKINNER and W. A. COCHEL (*Indiana Sta. Bul. 129, pp. 233–278*).—The object of the

experiments reported was to study the influences of the various factors which determine the profits from feeding beef cattle. The work extended over a period of 2 winters and has involved the use of 212 cattle. In calculating the cost of gain the value of the different feeds has been estimated at the following prices: Shelled corn 40 cts. per bushel, cotton-seed meal $28 per ton, and corn silage $2.50 per ton. In estimating the profit the value of the pork produced from hogs following the cattle is included.

The first series of experiments was to determine the influence of age on economy and profit in fattening cattle. A ration of shelled corn, cotton-seed meal, clover hay, and corn silage was fed to calves, yearlings, and 2-year-olds, with the results as shown in the following table:

Influence of age on economy and profit in fattening steers in winter.

Animals fed.	Year.	Initial cost per pound.	Initial weight.	Average daily gain.	Cost per pound.	Selling price per pound.	Final weight.	Profit per animal.
		Cts.	*Lbs.*	*Lbs.*	*Cts.*	*Cts.*	*Lbs.*	
19 calves	1906–7	4.50	508.8	2.08	5.35	5.35	883.0	$6.13
10 yearlings	do	4.15	922.0	2.38	7.62	5.60	1,351.6	9.24
10 2-year-olds	do	4.25	1,010.8	2.57	7.59	5.60	1,474.5	10.04
20 calves	1907–8	4.50	534.0	1.88	5.86	6.30	872.5	9.01
10 yearlings	do	4.15	853.6	2.21	7.85	6.50	1,252.1	13.80
2-years-olds	do	1.00	1,123.5	2.65	7.90	6.70	1,602.1	22.68

"The amount of feed consumed and the daily gain per steer increases with the age of the cattle."

"The amount of feed required to produce a pound of gain on calves was much less than with older cattle."

Two experiments were made with 2-year-old steers similar to those of the previous experiment to determine the feeding value of corn silage when fed with shelled corn and clover hay. In 1906–7 the experiment lasted 180 days. Ten steers fed shelled corn and clover hay made an average daily gain of 2.01 lbs., at a cost of 8.56 cts. per pound, and a similar lot receiving shelled corn, clover hay, and corn silage made a corresponding gain of 1.85 lbs., at a cost of 8.31 cts. per pound. In 1907–8 the experiment was repeated, lasting 150 days, when the steers fed the corn and clover ration made a gain of 1.9 lbs., at a cost of 9.13 cts. per pound, and those fed the corn, clover, and silage ration made a gain of 1.8 lbs., at a cost of 9.3 cts. per pound.

"In the financial statements of the two lots fed in 1906–7 it will be seen that the profit per steer was practically the same whether fed on corn and clover or on corn, clover, and silage. . . . The financial statements for the year 1907–8 show a profit of $18.41 in favor of the lot fed silage."

A second experiment was conducted to determine the value of a ration composed of shelled corn, cotton-seed meal, clover hay, and corn silage as compared with a similar ration without the silage. The initial value of these cattle was $4 per hundred in both lots. The initial weight was 1,123 lbs. in the silage-fed lot and 1,130 lbs. per steer in the lot fed no silage. At the end of the six months period, the lot receiving silage averaged 1,602 lbs., while that receiving no silage weighed 1,570 lbs. The 10 steers which received silage made an average daily gain of 2.66 lbs., at a cost of 7.91 cts. per pound. Those not receiving silage made an average daily gain of 2.44 lbs., at a cost of 8.75 cts. per pound.

The results indicate that corn silage may profitably be made a portion of the ration for finishing cattle.

Two tests were undertaken to determine the value of cotton-seed meal as a supplement in fattening 2-year-old steers. In the first experiment, which lasted 180 days, the basal ration consisted of shelled corn, clover hay, and corn silage. With cotton-seed meal as a supplement the average daily gain of 10 steers was 2.57 lbs., at a cost of 7.59 cts. per pound. Without the cotton-seed meal supplement the average daily gain of a similar lot was 1.85 lbs., at a cost of 8.31 cts. per pound.

"The addition of cotton-seed meal did not decrease the total amount of other feeds consumed, but seemed to stimulate the appetite of the steers to such an extent as to increase the daily feed consumed practically 3 lbs. per head."

In the second test, lasting 150 days, with cotton-seed meal as a supplement, the average daily gain was 2.7 lbs. at a cost of 7.83 cts. per pound. Without the cotton-seed meal the average daily gain was 1.8 lbs., at a cost of 9.3 cts. per pound.

In another test lasting 150 days no silage was fed. With cotton-seed meal as a supplement to corn and clover there was an average daily gain of 2.6 lbs., at a cost of 8.3 cts. per pound. Without the cotton-seed meal the average daily gain was 1.9 lbs. at a cost of 9.13 cts. per pound.

In another experiment clover hay was compared with timothy hay as a roughage. With the clover hay and shelled corn the average gain was 2.01 lbs., at a cost of 8.56 cts. per pound. With the shelled corn and timothy hay the average daily gain was 1.56 lbs., at a cost of 9.27 cts. per pound.

"The results of these experiments showed a much greater profit from fattening cattle in the winter of 1907–8 than in that of 1906–7.

"There is a marked difference in similar rations grown and fed in different seasons.

"High grade, blocky, early maturing beef calves showing both breeding and quality, are necessary in making yearling beef.

"Quality and type are not so essential in feeding aged steers as in feeding calves, provided the purchase price is proportionate. . . .

"The amount of pork produced from the droppings increases with the age of the cattle.

"When clover hay replaces timothy hay in the ration there is a greater amount of pork produced."

Steer feeding. III, Results of short v. long feeding periods, J. H. Skinner and W. A. Cochel (*Indiana Sta. Bul. 130, pp. 287–301*).—This bulletin reports the progress made at the station the past 2 years in securing data as to the rate and cost of gain, feed consumed, degree of finish obtained, and profits secured from feeding cattle through a long period of 180 days as contrasted with a short period of 90 days.

In both series of experiments reported two lots of 10 steers each were fed shelled corn, cotton-seed meal, clover hay, and corn silage. The corn was valued at 40 cts. per bushel. In the experiment in 1906–7, the average daily gains per head were for the long period 2.57 lbs., at a cost of 7.59 cts. per pound, and for the short period 3.16 lbs., at a cost of 6.98 cts. per pound. In 1907–8, the corresponding average daily gains of the long-fed steers were 2.66 lbs. per head, at a cost of 7.91 cts. per pound, and of the short-fed steers 2.85 lbs., at a cost of 7.83 cts. per pound.

In the first test the total amount of corn necessary to finish each steer was 34 bu. in the "short-fed" lot and 54.6 bu. in the "long-fed" lot; in the second test 42.5 bu. and 61.1 bu., respectively. In the "short-fed" lot it was necessary to put on 285 lbs. per head in the first test and 318 lbs. in the second test to

attain the marketable finish obtained from 464 lbs. and 479 lbs., respectively, in the "long-fed" lot.

During the period when both lots of cattle were in the feed lot there was a greater profit per head from feeding the heavier, fleshier steers. The gains were cheaper on the thinner cattle during the first 3 months of the test, but when fed to the same marketable finish the cost of gains was practically the same.

In 1906–7 the margin necessary to prevent loss on the "short-fed" cattle at the time of marketing was 48 cts. per hundred pounds; on the "long-fed" cattle at the same time, 50 cts.; and on the "long-fed" cattle at the time of marketing, $1.04. In 1907–8 the corresponding margins necessary were 92 cts., $1.01, and $1.54 per hundred pounds.

Details are given of the method of feeding the carload lot of steers which won the first prize in the 2-year-old champion class at the International Live Stock Show of 1907. These steers made an average daily gain of 3.25 lbs. per head, at a cost of 6.8 cts. per pound.

Feeding experiments with cattle and sheep, 1904–1908, D. A. GILCHRIST (*County Northumb., Ed. Com., Bul. 12, pp. 39; abs. in Irish Farming World, 22 (1909), No. 1088, p. 29*).—From Armstrong College, New Castle-on-Tyne, several feeding experiments for the past 4 years are reported.

It is concluded that a daily ration of 56 lbs. of sweet turnips per 800 lbs. live weight is suitable for fattening cattle. Egyptian and Indian-cotton cake have about the same feeding value. Delinting Indian cotton seed before the seed is crushed increases its feeding value. Peanut, sesame, and niger (*Guizotia oleifera*) cakes gave poor results and contained considerable amounts of sand. Analyses are given.

Cattle breeds of Morocco, G. DE GIRONCOURT (*Agr. Prat. Pays Chauds, 8 (1908), No. 68, pp. 390–399, figs. 4*).—Morocco contains much fertile land and there are vast pastures devoted to stock raising. From a zootechnical point of view it is more like Andalusia than Algeria. In northern Morocco the cattle may be divided into three types. The grayish-black cattle along the river Loukkos are brachycephalic, with lyre-formed horns, and are a good beef cattle. On the plains of the Sebou is a brachycephalic type, with short thick horns. These cattle are red or reddish-brown in color and are a good dairy breed. Farther south, among the tribes of Zemmour, is a general purpose breed of a dolichocephalic type, with long horns curving downward. The coat color varies, but is usually a mixture of black and gray.

The advantages of cattle raising in Guipuzcoa (*Prog. Agr. y Pecuario, 14 (1908), No. 591, pp. 471–475, figs. 7*).—An account of the native and introduced cattle breeds of this Spanish province.

Caracul sheep and broom meadows, VON LEPEL (*Illus. Landw. Ztg., 28 (1908), No. 101, pp. 861, 862*).—The author believes that caracul sheep may be successfully raised in Germany. Broom ought to be a good feed if small quantities are fed at first. Crosses with hornless native sheep give polled offspring, with pendent ears and coat characteristics of the caracul.

Lamb feeding (*Oklahoma Sta. Rpt. 1908, pp. 72, 73*).—Notes on feeding and handling lambs under Oklahoma conditions.

Market classes and grades of sheep, W. C. COFFEY (*Illinois Sta. Bul. 129, pp. 577–635, figs. 47*).—This bulletin, which defines and illustrates the classes and grades of sheep recognized in the Chicago and other large markets, is the result of a personal study of the subject at the Union Stock Yards at Chicago. The market classes enumerated are mutton, feeder, and breeding sheep. The subclasses of the mutton class are lambs, yearlings, wethers, ewes, bucks, and stags. Feeder sheep are almost exclusively western and the subclasses are

lambs, yearlings, wethers, and ewes. The subclasses of breeding sheep are bucks and ewes. Each subclass is divided into grades based on differences between the best and the less desirable animals. In the mutton class these differences are based on quality, condition, weight, and form; in the feeder class on quality, form, condition, and weight; and in the breeding class on age, constitution, form, breeding, quality, and condition. The characteristics of the different classes and grades are considered in detail.

Principles of modern swine breeding (*Landw. Wchnbl. Schles. Holst., 58 (1908). Nos. 48, pp. 827–829; 49, pp. 842–846; 50, pp. 857–859; 51, pp. 873–876; 52, pp. 886–889*).—A series of popular articles on the swine industry from the economic standpoint.

The preservation of our native types of horses, G. M. Rommel (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 85–143, figs. 19; Circ. 137, pp. 85–143, pl. 1, figs. 19*).—The author discusses the development of horse breeding in the United States, with special reference to the origin of types of light horses. Special topics discussed are the influence of Morgan blood on the saddle horse, "saddle" blood in American carriage horses, and the Standard bred as a carriage horse. It is stated that the classification of American carriage horses, formulated by this Department in cooperation with the American Association of Trotting Horse Breeders, has met with widespread adoption. The stud records of the breeding experiments in cooperation with the Colorado and Vermont stations, and the pedigrees of Department studs, are given in the article.

"In the Department's work the individuality of a horse is the point given greatest weight in his selection, and strict selection to type is the policy in view. Wherever possible (as in the last Kentucky purchase), the inheritance of type has been combined with the selection of type in the individual, and naturally an animal that inherits good individuality from his ancestors and is himself a good individual is much more valuable for the Department breeding establishments than one without such an inheritance."

Progress in Wisconsin horse breeding, A. S. Alexander (*Wisconsin Sta. Bul. 169, pp. 3–56*).—This bulletin reports the effects of the operation of the Wisconsin stallion law (E. S. R., 18, p. 764; 19, p. 774), upon the horse breeding industry of this State. As the result of this law 553 grade animals, many of which were unsound, have been retired from public service. The bulletin also contains a directory of owners of 225 pure-bred and 327 grade stallions and jacks licensed in 1908 and of the transfers of ownership of animals previously listed.

French breeds and poultry culture in Russia, De Gontcharoff (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 9, pp. 1113–1120*).—Houdan, Faverolle, La Flèche, Crèvecœur, Bresse, Mans, and Barbezieux breeds have been imported by Russian breeders. The Houdan is more common but the Faverolle is more easily acclimated. The Toulouse goose has produced excellent results when crossed with native breeds. Rouen ducks are superior to native stock. Pigeons and rabbits are not extensively raised for table use. French turkeys are not hardy enough for the Russian climate and the breeders are now importing the American Bronze.

The poultry work of the Bureau of Animal Industry, R. R. Slocum (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 353–360*).—This is a paper based on an address before the American Poultry Association at Niagara Falls, N. Y., August 11, 1907, and contains an account of the investigations on poultry husbandry and a list of publications on this subject by this Department, with suggestions as to future work.

Mrs. Basley's poultry book, Mrs. A. Basley (*Los Angeles, Cal., 1908, pp. 192, figs. 50*).—This is a general treatise for people who wish to raise poultry on the Pacific coast, and is in part a synopsis of a previous work on Woman's

Work in the Poultry Yard. Nearly half of the book is devoted to questions and answers of a practical nature.

Cost of rearing ducklings, E. and W. BROWN (*Jour. Bd. Agr. [London], 15 (1908), No. 9, pp. 664–671*).—This is a report of results of experiments on the poultry farm at the University College, Reading, to determine the cost of rearing ducklings conducted similarly to the previous experiments on the cost of raising chickens (E. S. R., 16, p. 297).

Forty Aylesbury ducklings were hatched April 28, 1908, in an incubator from 60 eggs. For 2 weeks they were fed a wet mash of bran, toppings, barley meal, linseed meal, and meat. Half of them were continued on this feed until 9 weeks old and made a total gain of 66 lbs. 10.88 oz. at a cost of 4.7d. per pound gain. The remainder after the first 2 weeks received the same mixture in a dry condition and made a total gain of 60 lbs. 2.88 oz. at a cost of 5.06d. per pound. The total cost of rearing a duckling 24 weeks was nearly 5s. The rearing of ducks for winter marketing was, therefore, less profitable than the breeding of spring ducklings.

Miscellaneous information concerning the live-stock industry, J. ROBERTS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 375–417*).—This article consists mainly of statistics on the live-stock market of 1907, Federal meat inspection, our foreign trade of animals and animal products, home and foreign meat prices, registered live stock in the United States, certified pedigree record associations, standards for dairy products, and contagious diseases of animals in foreign countries.

The development of the export trade in pure bred live stock, G. M. ROMMEL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 345–352*).—This is a paper presented at the meeting of the Missouri State Board of Agriculture at Columbia, January 7, 1908. The export trade of the United States in breeding animals is small. Among the obstacles in the way of foreign trade are the prevalence of disease in many foreign countries, inadequate means of transportation to some countries, especially South America, and inconvenient methods of exchanging money and credit. A government breeding farm is recommended where American types can be bred and advertised as such.

Experiments on the absorption of fat from an isolated loop of small intestine in healthy dogs, O. H. PLANT (*Amer. Jour. Physiol., 23 (1908), No. 2, pp. 65–80, fig. 1*).—Experiments were made on 3 half-grown female dogs. A loop of the small intestine was made in such a way as to eliminate the influence of the bile and pancreatic juices and yet not interfere with the blood supply of the loop or the general nutrition of the animal. The fats used were sweet cream, soap emulsion of neutral cotton-seed oil, soap solution of oleic acid and sodium hydroxid, oleic acid, and neutral cotton-seed oil. These substances separately, and also mixed with bile salts, were placed in the loop at different periods.

"Bile salts greatly increase the absorption of fats from a mixture that contains free fatty acid or soap. They only slightly increase the absorption of neutral oil.

"Solutions of soap, in the absence of other fat, are absorbed from a loop of intestine in greater percentage than emulsified fats; this is also true of fatty acid dissolved by bile salts.

"Neutral oil can be absorbed without the action of either bile or pancreatic juice from a loop of intestine where both these secretions are excluded. Under such conditions the neutral oil becomes markedly acid in reaction.

"Taken as a whole, the results of these experiments favor the theory that fats are absorbed in solution rather than as emulsified fats."

Arsenic in the animal body, W. H. Bloemendal (*Arch. Pharm., 246 (1908), No. 8, pp. 599–616*).—After administrations of arsenic, post-mortem examinations revealed its presence in all parts of the animal body, its relative predominance being as follows: Nails, hair, spleen, thyroid, skin, lungs, liver, kidney, heart, bones, muscles, sex organs, and brain. In the human body a larger portion of the acid was excreted than in cows, goats, or rabbits. But little arsenic was found in the milk of the cow or goat or in human milk and no traces were found in the fetal circulation of young rabbits.

DAIRY FARMING—DAIRYING—AGROTECHNY.

The influence of nonproteid nitrogenous compounds of feeding stuffs upon milk production, A. Morgen, C. Beger, and F. Westhausser (*Landw. Vers. Stat., 68 (1908), No. 5–6, pp. 333–432; abs. in Fühling's Landw. Ztg., 57 (1908), No. 21, pp. 734, 735*).—A continuation of experiments (E. S. R., 18, p. 978), in which sheep and goats were fed a basal ration supplying on an average about 2.5 kg. protein and 1 kg. fat per 1,000 kg. of live weight. At different periods a portion of the protein, about 09 kg. per day, was replaced by amids and by carbohydrates. The principal amid used was an extract from malt sprouts. The results are summarized as follows:

Yield of milk and milk solids with different protein substitutes as compared with the yield on a protein ration.

Kind of ration.	Milk.	Dry matter.	Nitrogen.	Fat.	Carbohydrates.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Amids	81.9	79.4	77.9	79.0	81.8
Carbohydrates	78.0	75.4	73.2	76.2	78.3
Asparagin	86.3	80.8	86.2	70.5	83.9
Ammonium acetate	93.7	98.9	96.7	.....	90.4

The largest amount of milk and milk solids was obtained with the protein ration. The amids of malt-sprout extract were much inferior in feeding value to those of the plant extract. The different rations had but a trifling effect on the quality of fat when tested with a refractometer.

The protein was better digested when no amids nor carbohydrates were substituted. With asparagin as a substitute the quantity of fat was reduced. During the amid period there was a larger amount of protein in the feces. The authors consider that the amids were changed into indigestible proteids and that this transformation probably took place in the upper part of the small intestine.

The absorption of drugs by milk in the mammary glands (*Arch. Pharm., 246 (1908), No. 8, pp. 593–598; Pharm. Weekbl., 45 (1908), No. 44, pp. 1357–1362; abs. in Chem. Zentbl., 1908, II, No. 21, p. 1742*).—Drugs were administered through the mouth and by hypodermic injections. L. Van Itallie found that physostigmin, pilocarpin, morphin, opium, sodium salicylate, salol, turpentine oil, phenolphthalein, and rhubarb did not appear in cow's milk, but that potassium iodid, arsenic, and fluorescein were present in small quantities. Arsenic, fluorescein, phenolphthalein, and oxymethylanthrachinone were found in the excreta. Mrs. A. Reijst-Scheffer found that when iodin was administered most of it was excreted. Of that portion appearing in the milk nearly all was found in the whey. There were traces in the casein but none in the fat.

A comparison of practical methods for determining the bacterial content of milk, P. G. HEINEMANN and T. H. GLENN (*Jour. Infect. Diseases, 5 (1908), No. 4, pp. 412–420, chart 1*).—Experiments were undertaken in order to promote uniformity in laboratory procedure for comparing the various methods now in use. Many workers favor an incubation temperature of 37° C. because it saves time, but the authors believe that incubation at 20° is superior because a higher count and a better differential count are obtained. At 37° acid formers, which are chiefly of fecal origin, are favored at the expense of the nonacid formers.

"Some milk bacteria of the *Bacterium aërogenes* type form red colonies at first and then later these colonies assume the blue color again. This phenomenon was not observed in dextrose agar. We conclude from this that dextrose is to be preferred as an addition to the medium to lactose.

"Official bacterial standards for milk should include a statement of the methods by which the bacteriological control is to be obtained. Since milk is usually consumed before the results of a bacteriological examination can possibly be reported, a gain of one or even two days is immaterial. The bacteriological and chemical examination of milk ought to be carried on chiefly with the object of improving the whole milk supply of a commonwealth rather than punishing individual offenders. To this end the most accurate and scientific method of examination is the preferable one."

A study of the determination of bacteria in milk in relation to the composition of the media, Z. NORTHRUP and BELL FARRAND (*Michigan Sta. Rpt. 1908, pp. 130–152*).—To determine the media most favorable to the growth of germs in milk, media were prepared of agar, peptone, and salt and divided into four portions, adjusting them to 5°, 10°, 15°, and 20° acid, respectively, with normal sodium hydroxid. Milk from 0 to 6 hours old was used for plating and the accounts were kept at 21° and 37° C. A bacterial count was taken at intervals to ascertain the degree of acidity, the percentage of lactose, and the percentage of peptone most conducive to the growth of the milk germs. The results are summarized in the following table:

Percentage of samples growing best under various conditions at 21° and 37° C.

Temperature.	Degree of acidity.				Lactose content.					Peptone content.					
										Lot 1.			Lot 2.		
	5°.	10°.	15°.	20°.	0°.	1°.	2°.	3°.	4°.	0°.	1°.	3°.	0°.	1°.	3°.
°C.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
21.....	5	21	64	10	15	27	22	15	21	22	6	72	35	38	27
37.....	14	22	47	17	20	10	17½	17½	35	27	6⅔	66⅔	35	23	42

As regards temperature, 63 per cent of the samples were found to grow best at 21°, 9 per cent at 37°, and the remainder indeterminate.

"To check up the results obtained by plating the miscellaneous milk organisms, pure cultures of dairy germs (taken from butter), were grown on whey, ordinary and 4 per cent lactose agar.

"Four per cent lactose agar was used in this experiment as it was found to support the growth of the milk germs better than the ordinary (1 per cent) lactose agar, at 37° C. The explanation for this is that the media, in the percentage of lactose, reaches more nearly the composition of milk.

"All media was made according to standard methods, and adjusted to 15° acid. . . .

"The lactic germs grow equally well on ordinary and on lactose agar, while the associative germs prefer the ordinary agar. However, the results are not especially marked in either case."

Bacteria in milk, L. A. ROGERS (*U. S. Dept. Agr., Farmers' Bul. 348, pp. 24, figs. 6*).—This is a reprint from the Yearbook of this Department for 1907 (E. S. R., 20, p. 275).

Investigations on the bacterial content of dried milk, A. KOSSOWICZ (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 9, pp. 719–724; abs. in Chem. Zentbl., 1908, II, No. 18, p. 1531*).—Drying reduces the bacterial content to some extent. *Bacillus sinapivagus, B. prodigiosus,* and *B. fluorescens liquefaciens,* however, are not destroyed. Dried milks may become reinfected if not kept in closed vessels.

Milk and its products as carriers of tuberculosis infection, E. C. SCHROEDER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 183–199; Circ. 143, pp. 183–199*).—This is a paper presented at a meeting of the New York Milk Committee, New York, April 11, 1908. The author presents evidence to show that tubercle bacilli are frequently present in milk delivered by dairymen to their city consumers; that the manner in which tubercle bacilli are eliminated from the bodies of tuberculous cattle offers a strong reason to suspect that they will contaminate milk; that the presence of tubercle bacilli certainly insures their presence in cream, ice cream, butter, and cheese made from it; and that we have no satisfactory reason for assuming that tubercle bacilli in milk and other dairy products are harmless to human beings. References to the literature of this subject are appended.

Some important factors in the production of sanitary milk, E. H. WEBSTER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 161–178, figs. 12; Circ. 142, pp. 161–178, figs. 12*).—A popular article on this topic. The differences between a sanitary and unsanitary dairy equipment are illustrated. Other topics treated are the methods of caring for milk, the score-card system of dairy inspection, the health of the cows and the attendants, and the purity of the water supply in dairies.

The classification of milk, A. D. MELVIN (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 179–182*).—The substance of this article is contained in Circular 114 of the Bureau of Animal Industry previously noted (E. S. R., 19, p. 372).

The chemistry of milk and milk products in 1907, M. SIEGFELD (*Chem. Ztg., 32 (1908), Nos. 57, pp. 673–675; 58, pp. 686–688*).—A review of the literature of European investigations on the chemistry of milk for that year.

On the characteristics of butter, L. HOTON (*Rev. Internat. Falsif., 19 (1906), No. 4, pp. 115, 116; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 10, pp. 611, 612*).—Fats were compared with their fatty acids by means of an Abbé-Zeiss refractometer. The difference between the two figures in the case of butter was from 10 to 11, for oleomargarine 13 to 14, and for cocoa butter 15 to 16. The author reports a number of determinations on the liquid and semisolid portions of butter. The Reichert-Meissl number for the liquid portion was 31, for the semisolid 28.5. Similar tests were also made of fresh butter, of butter that had been preserved for several years, and of butter exposed to the air.

On the composition of Dutch butter made in the creameries placed under state control (*Gen. Dir. Agr. Min. Agr., Indus. and Trade [Netherlands]. [Circ.], 1908, Oct., pp. 3*).—A classification of 1,667 samples of butter, according to their Reichert-Meissl number.

Milled butter (*New Zeal. Dairyman, 14 (1908), No. 2, p. 69*).—Milled butter is a term used in New Zealand for butter that has been mixed or blended, as is practiced in Holland and Denmark. By mixing butters from different dairies the output is made more uniform.

The care and testing of Camembert cheese, C. THOM (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 339–343; Circ. 145, pp. 339–343*).—The topics treated in this article are the proper appearance of ripe Camembert cheese; the variations in flavor among really good cheeses, corresponding to the widely different tastes of consumers; how to test a cheese to determine its degree of ripeness without cutting it; and how cheeses not fully ripe should be handled by dealer and consumer to get the best results.

Methods of paying for milk at cheese factories, L. L. VAN SLYKE (*New York State Sta. Bul. 308, pp. 469–506*).—This bulletin discusses the different methods of paying for milk at cheese factories and, as in former bulletins (E. S. R., 9, p. 181), "the exclusive use of the milk-fat basis is advised, since it is the method which takes into consideration composition and quality of cheese in connection with yield of cheese, thus providing an equitable and simple system."

Paying for milk at Cheese factories, F. H. HALL (*New York State Sta. Bul. 308, popular ed., pp. 7*).—A popular edition of the above.

Creamery accounting, J. A. VYE (*Chicago Dairy Produce, 15 (1908), No. 28, pp. 20, 22, 23*).—The author outlines a plan for a uniform system of keeping accounts in cooperative creameries.

The cow-testing association in dairying, P. V. MARIS (*Pacific Homestead, 18 (1908), No. 17, pp. 1, 2, 19*).—The history of cow-testing associations is briefly reviewed. The author advocates their formation in all dairy communities because of their acknowledged value in improving the dairy herds wherever they have been formed.

The dairy industry in the South, B. H. RAWL, D. STUART, and G. M. WHITAKER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 307–337, figs. 10; Farmers' Bul. 349, pp. 37, figs. 10*).—This is an account of the systematic field work by this Department to develop the dairy industry in the Southern States, which was begun in 1906, and is carried on in cooperation with the State experiment stations, agricultural colleges, and State departments of agriculture. D. Stuart discusses Southern Markets for Dairy Products, G. M. Whitaker The Milk Supply of Southern Cities, and B. H. Rawl Why Dairying is Undeveloped in the South. It is pointed out that although the demand for milk and milk products in the South is not supplied by home products, dairying has hitherto been unprofitable because too many dairymen keep inferior cows, feed them on purchased feeds, and produce an inferior grade of milk and butter.

[The dairy industry in foreign countries] (*Mo. Cons. and Trade Rpts. [U. S.], 1908, No. 339, pp. 103–110*).—In northern Spain the Cantabrian slopes are well suited for dairy farming, but the lack of capital is the leading obstacle to the development of the industry. Primitive methods are employed in dairying. Special kinds of cheese manufactured in this region, notably Cabrales, a kind similar to Roquefort, have a ready sale in Spain, such being equally the case with butter made in Asturias and Santander.

In Ireland, the yield of milk per cow is lower than in most other countries. Comparative statistics show that the value of dairy products in Canada is increasing. Vice-consul Doyle, of Colombo, Ceylon, thinks that the ravages of typhoid fever could be reduced if a sanitary milk bottle were used in the delivery of milk. In spite of its natural advantages for cattle raising, Brazil imports large quantities of dairy products. The dairying district has increased during the past few years and there is a good opening for American

dairy machinery. The greatest obstacles for further development are lack of transportation facilities and the prevalence of cattle diseases. Colombia is stated to be a wonderful cattle country, but the milk produced is simply for local consumption or made into a crude white cheese. Modern dairy apparatus is needed.

Dairy cattle in far away India, P. A. YODER (*Kimball's Dairy Farmer, 6 (1908), No. 23, pp. 24, 25, figs. 3*).—A popular account of dairying in that country. At the government dairy farm in Poona the Aden is considered the best breed of zebus. The Delhi breed of buffaloes is also liked for dairy purposes. Some are of large size and weigh a ton or more. The feeds consist of native hay, bran, oil cake, cotton seed, dahll (pigeon pea), and phool (husks from the dahll). Some of the black cows or buffaloes give 25 lbs. of milk per day.

The dairying industry, G. S. THOMSON (*London, 1907, pt. 1, pp. 263, pls. 53, figs. 3, dgms. 2*).—This is a general treatise on dairying, with special reference to the milk and cream supply as applied to the conditions in Queensland, Australia. In this, the first part of the work, the topics discussed are the composition and secretion of milk, metropolitan milk supply, dairy science for the practical farmer, and modern utensils used in dairying.

Milk booklet, R. OSTERTAG and T. HENKEL (*Schr. Deut. Milchw. Ver., 1908, No. 37, pp. 67, figs. 6½*).—This pamphlet treats in a popular manner of the structure of the udder, the excretion of milk, the methods of milking, and influences that affect milk secretion.

Tests of three devices for purifying milk, K. H. M. VAN DER ZANDE (*Off. Organ Alg. Nederland. Zuivelbond, III, No. 17; abs. in Milch. Ztg., 37 (1908), No. 47, pp. 554–556, figs. 3*).—Descriptions are given of a milk filter and two styles of milk sieves exhibited at the International Agricultural Exposition at The Hague, September 1907.

[Some appliances for use in dairy bacteriology], O. RAHN (*Michigan Sta. Rpt. 1908, pp. 125, 126, fig. 1*).—The author keeps tubes of media in large glass jars with covers, containing 70 to 150 test tubes. The bottom of the jar is covered with excelsior and is kept moist by ½ per cent mercury bichlorid solution, which stands about 1 cm. high in the jar.

A convenient Petri dish rack is described. It is made from strips of galvanized sheet iron, riveted together to stand the heat of the hot air sterilizer. One of the side strips may be opened by a hinge and may be fastened with a hook.

[Experiments in dairying and agrotechny], H. A. HARDING and L. L. VAN SLYKE (*New York State Sta. Rpt. 1907, pt. 3, pp. 110, 111, 114, 115, 117, 118, 163–220, 233–237*).—A summary of the more important results found at this station during the first 25 years of its work.

The best temperature at which to run milk through a continuous pasteurizer when tuberculous germs are suspected is 185°. The amount of protein in mottled butter is greater in the light portions and is the cause of the lighter color. Many experiments as to the composition of milk and its relation to the yields of cheese were made. In the process of cheese making the fat lost in the whey is independent of the percentage of fat in the milk. The casein is lost in the form of small particles of curd. Milk for cheese making should be paid for according to the percentage of fat in the milk. The beneficial effects of covering cheese with paraffin and curing at low temperatures were demonstrated. A number of factors influenced the amount of acid taken up by the casein during ripening. In ripening the insoluble proteid is eventually changed to a water-soluble form. A fishy flavor in cheese was found to be due to a physiological abnormality in one of the cows. A bitter flavor in Neufchâtel cheese

was caused by a germ. Sweet flavors in Cheddar cheese are due to yeasts. *Bacillus rudensis* is the cause of rusty spot.

The swelling of canned peas was due to a single species of bacteria. Studies were made on the chemistry of apple juice and homemade cider vinegar.

Process for transforming milk into a solid substance, G. V. Frye (*French Patent 389,835, May 2, 1908; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 20, p. 1026*).—By a process which is patented, milk is subjected to the action of an electric current, then oxidized, and molded into various shapes and dried. Collodion and oil may be added to produce elastic substances. The product is chiefly of use as an electrical insulator.

Preservation of unfermented fruit juice (*Oklahoma Sta. Rpt. 1908, p. 71*).—Directions are given for the preservation of the unfermented juice of apples and grapes.

Sulphurous acid in wine making, E. Dupont (*Rev. Vit., 30 (1908), Nos. 767, pp. 230–233; 768, pp. 253–257; 769, pp. 284–289; 770, pp. 309–312*).—A series of articles written for the use of the practical wine maker, and treating in a popular manner investigations previously reported (E. S. R., 19, p. 980).

Refrigeration in enology, B. Haas (*Rev. Vit., 30 (1908), No. 780, pp. 589–592*).—A popular article on the influence of temperature in wine making.

The preparation of wine in Algeria, J. Foussat (*Gouv. Gén. Algérie, Dir. Agr., Inform. Agr., Bul. 5, pp. 41, figs. 10*).—A popular account of wine making, with special reference to Algerian methods.

VETERINARY MEDICINE.

The effect of certain diseases and conditions of cattle upon the milk supply, J. R. Mohler (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 145–159*).—The diseases considered include tuberculosis, which is deemed probably the most important disease of cows from the standpoint of public health, actinomycosis, botryomycosis, foot-and-mouth disease, anthrax, cowpox, rabies, mammitis (mastitis or garget), gastro-enteritis, milk sickness, and septic or febrile conditions. Abnormal appearance and conditions of milk to be guarded against, such as slimy, stringy, or ropy milk, bitter milk, colored milk, poisonous milk, etc., are also considered.

The author makes the following recommendations as the basis for laws and for regulations by public health officers: "That all cows on dairy farms producing milk for market purposes be tagged, tattooed, or otherwise marked for identification.

"That all milk produced on such dairy farms shall either come from tuberculin-tested cattle, which shall be retested at least once a year, or be subjected to pasteurization under the supervision of the health authorities in case the herd is not tuberculin tested.

"That no additions to any herd, whether the herd has been tested or not, shall be made in the future without subjecting the additional cattle to the tuberculin test.

"That no license for the sale of milk shall in future be granted except to applicants having herds free of tuberculosis.

"That the milk of cattle showing any of the udder affections above mentioned, or anthrax, rabies, gastro-enteritis, septic conditions, or clinical symptoms of tuberculosis, shall not be utilized as human food, even though the milk be pasteurized. Milk from cows 15 days before and 5 days after parturition and that from animals receiving . . . deleterious medicaments or foodstuffs . . . shall likewise be excluded.

"That veterinary inspectors of the health department make frequent visits to dairies having untested herds, in order that they may discover all advanced cases of tuberculosis, or udder tuberculosis, as early as possible.

"That the various States pass laws granting an appropriate indemnity to all owners of tuberculous cattle which come under their respective jurisdiction, the said animals to be slaughtered in abattoirs having Federal inspection."

Foot-and-mouth disease, D. E. Salmon and T. Smith (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 141, pp. 8*).—This is a reprint with slight revision by D. E. Salmon and J. R. Mohler from the Special Report on Diseases of Cattle, previously noted (E. S. R., 16, p. 708).

Surra, R. J. Needham (*Jour. Dept. Agr. So. Aust., 12 (1908), No. 3, pp. 220–223*).—Attention is called to the importance of a strict inspection of all foreign vessels arriving at ports to prevent animals being landed from countries from which surra and other infectious diseases might be introduced.

The influence of heredity upon tuberculosis, A. Latham (*Lancet [London], 1908, II, No. 21, pp. 1512–1514*).—Some of the conclusions drawn by the author following a general survey of the subject are as follows: "The hereditary transmission of the germ is so infrequent that it is a negligible factor.

"The incidence of tuberculosis depends in the main on two factors—(a) exposure to infection, which in turn is governed by the dose received and the virulence of the particular strain of bacillus; and (b) the undermining of the resistance of the individual by insanitary conditions and by disease. . . .

"There is some evidence to suggest that the diminishing incidence and mortality of the disease may be in part due to a partial immunity inherited in the course of generations from tuberculous ancestors in whom the disease has been cured.

"The theory that there is an inherited predisposition to tuberculosis is based on insufficient evidence."

The eradication of tuberculosis in cattle, A. D. Melvin (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 209–214*).—This paper was presented at the annual convention of the American Veterinary Medical Association, held at Kansas City, Mo., in September, 1907, and has been previously abstracted (E. S. R., 19, p. 199).

The tuberculin test: Its method of application, value, and reliability, J. R. Mohler (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 201–207*).—This is a discussion of the tuberculin test, its origin, application, value, and reliability. It is stated that tuberculin is harmless for healthy animals and that it interferes in no way with the production of milk. The disposal of and indemnity for reacting animals is briefly considered, and a summary of directions for making the test is appended.

The tuberculin test of cattle for tuberculosis, J. R. Mohler (*U. S. Dept. Agr., Farmers' Bul. 351, pp. 8*).—This is a reprint of the above article.

The use of tuberculin in controlling tuberculosis in herds, C. J. Marshall (*Amer. Vet. Rev., 34 (1908), No. 2, pp. 220–227*).—A paper presented at the International Congress on Tuberculosis, held at Washington, in which a detailed account is given of the use of tuberculin. Attention is called to the importance of disinfection and sterilization of instruments, clothing, etc., before and during the time of making the test that contagious abortion, tuberculosis, and other contagious diseases may not be carried from animal to animal or from herd to herd.

The ophthalmo-reaction to tuberculin in cattle, K. Wölfel (*Berlin. Tierärztl. Wchnschr., 1908, No. 21, pp. 369–372; abs. in Vet. Rec., 21 (1908), No. 1058, p. 239*).—The author concludes that animals which react to the sub-

cutaneous injection of tuberculin do not always give the ocular reaction. The subcutaneous injection does not exercise any perceptible influence on a subsequent application of the opthalmic test. The congestion of the conjunctiva should take place 12 to 18 hours after the application of the tuberculin in the eye. It is not accompanied by a rise of temperature.

The epizootic diarrhea of calves and meat poisoning, V. Fally (*Rev. Gén. Méd. Vét., 11 (1908), No. 130, pp. 575–583*).—The author has studied the micro-organisms to determine the relations existing between epizootic diarrhea, a wide-spread affection of young cattle, and the poisoning that has frequently been observed to follow the consumption of veal. Calves affected with the disease were killed in extremis at the Brussels abattoir and the bacilli studied. When their cultural characters and agglutinin reactions were compared with those of the meat poisoning bacilli a close resemblance was found, it being impossible to distinguish the paracolon bacilli encountered in the calves from those belonging to the first enteritidis subgroup.

The dehorning of cattle, R. W. Hickman (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 297–306, figs. 6; Farmers' Bul. 350, pp. 14, figs. 6*).—The author here furnishes directions for the guidance of the dairy farmer or other cattle owner in the dehorning of cattle. Methods of dehorning as practiced on the range are briefly described, as is also the prevention of horn growth in young calves.

The inoculation of sheep against blue tongue and the results in practice, A Theiler (*Transvaal Agr. Jour., 7 (1908), No. 25, pp. 30–39*).—A report of the results of inoculation with virus obtained after the eleventh generation from sheep, a brief report of which has been previously noted (E. S. R., 20, p. 679). Between September, 1907, and February, 1908, over 90,000 doses of this vaccine were distributed in the Transvaal and over 100,000 doses among the other South African colonies. The absence of heavy rain during the season appeared to corroborate the theory that the carrier of the blue tongue micro-organism is a biting insect which requires water for its development. Detailed directions are given for the use of the vaccine, which has proved eminently successful.

Tuberculosis of hogs: Its cause and suppression, J. R. Mohler and H. J. Washburn (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 215–246, pls. 4; Circ. 144, pp. 215–246, pls. 4*).—This article has been substantially noted from another source (E. S. R., 19, p. 199).

Embryonal adenosarcoma of the kidney in swine, L. E. Day (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 247–257, figs. 8*).—The author reports the discovery of these neoplasms during the course of meat inspection work. They are said to usually escape notice until the post-mortem examination is made. "They appear as a large, encapsulated, irregular mass in the sublumbar region, extending perhaps from the diaphragm to the border of the pelvic cavity. Usually only one kidney is involved, but in some cases both are affected. When but one kidney is involved there is no predilection as to the side, the left kidney being affected as often as the right, and vice versa. These growths are comparatively rare and occur only in young hogs up to 18 months old. They grow very rapidly and may become very large. Recently one of these tumors weighing 60 lbs. was observed by the writer in a Chicago abattoir.

"The writer has never found such neoplasms in cattle or sheep and has no information that they have been observed in those animals by others."

The results of a histological study of these tumors are presented.

The leucocytes of the horse in health and disease, M. E. Tabusso (*Arch. Sci. R. Soc. Accad. Vet. Ital., 6 (1908), No. 3–4, pp. 33–49; abs. in Bul. Inst. Pasteur, 6 (1908), No. 17, p. 766*).—The original data here given include only investigations of the leucocytes of the well horse. In 1 cmm. of blood the author

found in the castrated male an average of 8,135 and in the female 7,140. The extremes were for the male 6,900 to 9,300 and for the female 6,200 to 7,900. The digestive period is accompanied by hyperleucocytosis.

Strangles and glanders, C. E. Gray (*Transvaal Agr. Jour.*, 7 (*1908*), *No. 25, pp. 25–30*).—Strangles or nieuwe ziekte and glanders are frequently confused in South Africa by horse owners. As such errors may lead to considerable loss and be attended by severe consequences, the two diseases are described the most marked points of difference indicated.

The colic of horses, S. Wall (*Die Kolik des Pferdes. Stockholm, 1908, pp. VII+179, figs. 47, charts 4*).—This study is based upon the records of cases at the clinic in Stockholm.

In 834 autopsies, the cause of death of 31.6 per cent was due to volvulus of the colon, 29.4 per cent to other displacements, including hernias, volvulus of the mesenteries, etc., and 23 per cent to ruptures of the stomach and intestines. During 15 years, 6,078 cases were recorded, of which 503 or 8 per cent resulted in death. The length of the attack in the cases which recovered was from 12 to 24 hours in 56 per cent and 36 to 48 hours in 40 per cent. In the fatal cases 61 per cent died in 12 to 24 hours.

The author classes colic under two heads—the first as chymostase or stoppage of the contents of the stomach and small intestines, and the second coprostase or stoppage in the colon, cecum, and rectum.

Influenza in horses, S. S. Cameron (*Jour. Dept. Agr. Victoria, 6 (1908), No. 10, pp. 619–624*).—Influenza of horses is reported as epidemic in Melbourne and its suburbs. The present visitation is apparently more marked both in the proportion of the horses attacked and in the severity of its effect than that of 1890.

Dermal mycosis associated with sarcoptic mange in horses, A. D. Melvin and J. R. Mohler (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 259–277, pl. 1, figs. 6*).—This paper was presented at the annual convention of the American Veterinary Medical Association held at Kansas City, Mo., September, 1907.

The disease here described was first noticed in 1901 among horses on the Umatilla Indian Reservation near Pendleton, Oreg., at which time 2,500 out of 6,000 horses kept on the reservation were more or less affected. A Fusarium causing the disease was grown on a potato medium and found to be the *Fusarium equinum*, described by Norgaard. "All ages and breeds of horses seem equally susceptible, as are both sexes, but there is considerable difference in the susceptibility of well and poorly nourished animals, since weak, impoverished, unclean, and neglected horses are more frequently attacked than horses in better condition. The animals stand around the rubbing post all day indifferent about eating, and finally become anemic and debilitated to such an extent that they die."

The morphology and cultural characteristics of the fungus are considered at length. Kerosene is said to have been used first as a remedy but later more satisfactory results have been obtained from coal tar dips. Experiments made by the Bureau of Animal Industry with a dip composed of sulphur and light dynamo oil in the proportion of 1 lb. of the former to 1 gal. of the latter have given good results.

Infectious anemia or swamp fever of horses, J. R. Mohler (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 138, pp. 4*).—In this circular the etiology, diagnosis, prognosis, post-mortem appearance, and treatment of infectious anemia are briefly considered.

The disease is due to an ultravisible virus which is transmissible to horses, mules, and asses by subcutaneous injection of blood serum. The incubation period following the inoculation of the virus is said to vary from 10 days to

1½ months. The virus has been found active in the carcass of an affected animal 24 hours after death. The probability of the disease being transmitted by flies, mosquitoes, internal parasites, etc., is receiving careful investigation. The prognosis of the disease is very unfavorable, veterinarians in different sections of the country where it is prevalent having reported a mortality of 75 per cent or higher.

Treatment thus far has been far from satisfactory. Investigations are now in progress with a view of producing a protective vaccine or serum.

Researches upon the piroplasmosis of horses in 1907, A. Belizer and Markinovski (*Abs. in Bul. Inst. Pasteur, 6 (1908), No. 17, p. 784*).—Investigations were pursued by the authors in the province of Riotan, Russia.

All of the horses attacked were found to be infested with the species of tick determined by Neumann as *Dermacentor reticulatus*. Native horses are immune while imported horses are very susceptible and often die with the disease. In experiments in which diseased animals were treated with different chemical products, the best results were obtained from injections of a solution of bichlorid of mercury and sodium. Atoxyl proved to be much less efficient. The authors found the different stages of Piroplasma described by Koch and Christophers in the blood and intestines of the tick, and a typical disease was produced by injections of blood from adult ticks. The inoculation of blood from immune horses gave good results and the authors state that immunity can be produced by the injection of small quantities of infected blood, which produce mild cases of the disease.

The administrative control of anthrax, F. W. Eurich (*Jour. Roy. Sanit. Inst., 29 (1908), No. 10, pp. 597–603*).—Examinations made of over 600 samples of dust derived from soil have failed to convince the author that this source is an important factor in the dissemination of the disease in man.

Anthrax has, however, been found in 15 per cent of the blood-stained wool and hair examined.

The theory and practice of antirabic immunization, W. F. Harvey and A. McKendrick (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1907, No. 30, pp. 2+43, pls. 2*).—The authors have summarized their conclusions as follows: "(1) There is evidence of a direct proportion between infectivity and duration of desiccation of rabies nerve material; (2) there is no evidence for the existence of a rabies toxin; (3) the quantity of living fixed virus and the duration of time of administration are the only points which need be considered in making out a scheme of antirabic treatment; and (4) there is great advantage in using fresh material in antirabic immunization (as in Höyges' or Ferrans' methods) over dried or heated material, because the former method involves the introduction of less injurious foreign nerve substance and is more accurate as regards dosage than the latter."

The curative influence of extracts of leucocytes upon infections in animals, P. H. Hiss, Jr. (*Jour. Med. Research, 19 (1908), No. 3, pp. 323–397*).—Experiments were conducted in which the animals used for obtaining leucocytes and for most of the experiments were rabbits. The author concludes that "it does not seem unlikely that extracts of leucocytes (polymorphonuclear and mononuclear), and possibly of the blood-forming organs, furnish us with means of combating infections incited by those micro-organisms generally looked upon as giving rise to endotoxin poisonings, and which have steadily refused to yield to the action of immune sera alone."

Annual report on progress in the study of the pathogenic micro-organisms, P. von Baumgarten and F. Tangl (*Jahresber. Path. Mikroorgan., 22 (1906), pp. XII+964*).—The authors present in this work a review of the investigations made during the year 1906 of the pathogenic bacteria, fungi, and protozoa,

In this work they have been assisted by various specialists. Bibliographies are given with each division and complete author and subject indexes are appended.

A preliminary account of the Acanthocephales of mammals. A. Porta (*Arch. Par., 12 (1908), No. 2, pp. 268–282*).—Thirty-three species representing the genera Echinorhynchus, Chentrosoma, Corynosoma, Bolbosoma, and Gigantorhynchus are noted.

The trypanosomes of mosquitoes and their relations to the Hæmoproteus of birds. D. Mezincesco (*Compt. Rend. Soc. Biol. [Paris], 64 (1908), No. 19, pp. 975, 976*).—In the intestines of Culicidæ, particularly *Culex richardi* and *C. fasculus* taken in Roumania, the author found *Crithidia fasciculata* to be very common and probably sometimes pathogenic. *Trypanosoma culicis* was rarely found. The inoculation of cultures of this trypanosome into laboratory animals, wild pigeons, and turtle doves resulted negatively.

Further results of the experimental treatment of trypanosomiasis; being a progress report to a committee of the royal society. H. G. Plimmer and H. R. Bateman (*Proc. Roy. Soc. [London], Ser B, 80 (1908), No. B543, pp. 477–487*).—A continuation of experiments in which rats affected with nagana and surra and dogs with surra, were treated with compounds of arsenic, antimony, and mercury.

From examinations of rats which had been inoculated with nagana and treated with sodium antimony tartrate it appears that the bone marrow is the place where trypanosomes can live the longest and that the liver is also a place where they can find protection. This is stated to be borne out by experiments made by the authors upon trypanosomiasis in birds.

Plain facts about the hookworm disease (*Prog. Farmer, 23 (1908), No. 43, pp. 4, 5, 16*).—A popular account of the hookworm and the disease which it produces in man.

Rocky Mountain spotted fever. A. A. Robinson (*Med. Rec. [N. Y.], 74 (1908), No. 22, pp. 913–922, figs. 2, map 1, charts 6*).—A general review of the literature with a report of a case. This disease is shown to have been reported from Montana, Idaho, Wyoming, Nevada, Oregon, Washington, Utah, and Colorado. It is suggested that the mountain mosquito as well as *Dermacentor occidentalis* may transmit the disease obtaining the virus from the same source. A map is given showing the distribution of the disease and a bibliographical list is appended.

The development of the Leishman-Donovan parasite in Cimex rotundatus. W. S. Patton (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1908, No. 31, pp. 2+25, pls. 2*).—"In the female as well as in the male bedbug (*C. rotundatus*) the parasites have by the third day passed through all the intermediate stages of development described up to the formation of the mature flagellates. Rapid multiplication by rosette formation is a characteristic feature of the development of the parasite in the bedbug. As the male bug sucks blood it probably plays as important a rôle in the transmission of the disease as the female bug.

"The infection acquired by the bug varies considerably, some ingesting large numbers of parasites, others only a few; and there is no evidence at present to show that the development in the bug depends on variations in the temperature.

"The tendency that the disease has to linger in a house for a long time is probably explained by the fact that the parasite may remain in the midgut of the bug for several days before beginning to develop, and, as the nymphs which take from 7 to 10 weeks to arrive at maturity, may ingest the parasites shortly after hatching, and as a rule feed only once between each molt, the

infection may remain for a considerable time in a house; there is no evidence at present to support the view that the infection is inherited by the bug."

Tenotomy of the perforatus in recidiving or incurable sprains of tendons, A. QUERRUAU (*Rec. Méd. Vét., 85 (1908), Nos. 11, pp. 349–357; 13, pp. 412–420; abs. in Amer. Vet. Rev., 34 (1908), No. 2, pp. 151–153*).—As a result of experiments continuing for 15 years, the author, an army veterinarian, concludes that the advantages that the tenotomy of the perforatus presents are such that it is the most radical and economical treatment to resort to in cases of recidiving or incurable sprains of the tendons, of the radial reinforcing band, and of the suspensory ligament and even in the relief of some incurable lameness due to traumatic synovitis of the great sesamoid sheath.

Plants poisonous to stock. The wallflower poison bush, J. C. BRÜNNICH (*Queensland Agr. Jour., 21 (1908), No. 2, pp. 89–91*).—Experiments made with alkaloidal extract of *Gastrolobium grandiflorum* which demonstrate the poisonous nature of the plant are reported.

Disinfection and commercial disinfectants, M. P. RAVENEL and K. W. SMITH (*Wisconsin Sta. Bul. 166, pp. 3–19, figs. 9*).—In this bulletin the author discusses various disinfectants and gives directions for their use. A number of commercial disinfectants were tested, organisms being exposed to different strengths at room temperature. They were then removed to fresh culture media and incubated at 37° C., the observations being kept up 72 hours.

"The results of these tests showed that a 2½ per cent solution of cresol, international dip, carboleum, chloro-naphtholeum disinfectant, zenoleum, germol, and daytholeum destroyed the germ causing pus and abscess (*Staphylococcus pyogenes aureus*), hog cholera, and the typhoid germ in 1 minute in every instance. A 10 per cent solution failed to destroy anthrax spores even after 3 hours exposure.

"Car-sul destroyed the germ causing pus and abscess, and hog-cholera germs in a 2½ per cent solution in 1 minute in every instance. A 10 per cent solution failed to destroy anthrax spores even after 3 hours exposure. A 1 per cent solution failed to kill the typhoid germ after 2 minutes exposure, destroyed it after 6 minutes exposure, but failed to kill anthrax spores.

"Dr. Robert's disinfectall killed the germ causing pus and abscess, and typhoid germs in a 2½ per cent solution in 1 minute. It failed to kill the hog-cholera germ in this strength in 1 minute, but killed it in 3 minutes. It failed to destroy anthrax spores after 24 hours exposure."

Antiformin, a disinfectant which dissolves bacteria, UHLENHUTH and XYLANDER (*Berlin. Klin. Wchnschr., 45 (1908), No. 29, pp. 1346–1349; abs. in Bul. Inst. Pasteur, 6 (1908), No. 20, p. 936*).—Antiformin is a trade name given to the alkaline liquid prepared by the addition of caustic soda to a solution of sodium hypochlorite (eau de Javelle). It has been used for some time as a disinfectant, especially in breweries for rapidly and thoroughly cleansing vats and pipes.

The authors have found that a solution of 2 to 5 per cent will destroy most bacteria including *Bacterium suisepticus* within 5 minutes. Spores of anthrax, however, resist its action. The disinfectant properties have remained for several months when kept in the laboratory. Even in dilute solutions antiformin was found to dissolve most of the bacteria without leaving a residue. The tubercle bacillus and other acid-proof bacteria show a remarkable resistance to its action even in concentrated solutions, and attempts have been made to utilize this fact in the isolation of a pure culture of the tubercle bacillus from sputum. Toxins and endotoxins have been destroyed by comparatively weak solutions. The authors recommend antiformin for disinfecting and deodorizing

excreta, and for disinfecting hands, wounds, and the skin for cutaneous diseases. It is also said to be of value in destroying the bacteria of potable water.

Cremating furnace, C. E. MARSHALL (*Michigan Sta. Rpt. 1908, pp. 122–125, dgms. 3*).—After having had grates of a cremating furnace burn out quite frequently it was found that 1¼ in. gas pipe could be used to support the material without such loss. Illustrations accompany the plans given of the cremating furnace.

RURAL ENGINEERING.

Irrigation in Wyoming, C. T. JOHNSTON (*U. S. Dept. Agr., Office Expt. Stas. Bul. 205, pp. 60, figs. 22, maps 3*).—The principal purpose of this bulletin is to present to parties contemplating settlement general information regarding the opportunities for settlement, the cost of land and water and of establishing homes on these lands, and regarding the crops grown. Much of the data deals with the geographic, economic, and climatic conditions.

It is stated that "probably no locality in the world is situated to control as many drainage basins as Wyoming," and these are discussed. Future development is deemed to be possible along every stream in the State where storage works may be provided. Approximately 1,000,000 acres of land are now irrigated, and with the total annual river discharge of 11,000,000 acre-feet this may be increased to 5,000,000 or 6,000,000 acres. The extent of irrigated lands and their products are discussed, reports from farmers relative to profits derived from various crops being given.

A large part of the bulletin is devoted to specific information regarding the irrigation enterprises affording opportunities for settlement. Following this suggestions are given as to the capital a settler should have, and the items of expense incidental to successful irrigation farming. In the latter connection estimates submitted by representatives of private projects are given.

The bulletin includes also a summary of the laws governing the use and control of water and their application, an account of the procedure under the Carey Act, and a few remarks as to the prospects for the future of irrigation farming in the State.

A report upon the drainage of agricultural lands in the Kankakee River Valley, Indiana, C. G. ELLIOTT (*U. S. Dept. Agr., Office Expt. Stas. Circ. 80, pp. 23, figs. 3*).—The problem presented here was to remedy the conditions in the lower Kankakee Valley arising from the isolated and localized attempts at improvement in the upper valley. The valley, its topography, the nature of the drainage problem, and the progress and methods pursued in attempting the improvement are briefly described, followed by a discussion of three possible plans for completing the reclamation. The one deemed to be best adapted to the situation is to straighten and enlarge the channel along the line of most direct and greatest slope. Descriptions of this line which was surveyed, of the Yellow River and a discussion of its influence on the overflow conditions, and other factors affecting the determination of the required size of channel are given, together with tabulated data pertaining to the plan and estimates of cost.

It is stated that no attempt has been made to discuss fully the engineering and economic features of the work, but rather "to bring before the owners of the valley lands the facts which are of most vital interest at this time, and to invite their consideration and criticism of the plan." . . .

Examples of large laterals and subdistricts which are necessary adjuncts to the scheme proposed are given at the end of the circular.

A report upon the drainage of the agricultural lands of Bolivar County, Mississippi, W. J. McEatiiron and S. H. McCrory (*U. S. Dept. Agr., Office Expt. Stns. Circ. 81, pp. 28, fig. 1*).—This report embodies the surveys, investigations, and plans for the drainage of 140,250 acres of land which is damaged by overflows from streams and bayous in the Yazoo Delta in Bolivar County, Miss.

The general topographic features and the soil and climatic conditions are discussed in their relation to the drainage of the locality. The plans, which contemplate the improvement of the natural drainage channels by cleaning, enlarging, and cutting off bends, are supplemented with estimates of quantities and costs and suggestions as to the manner of doing the work. The survey data given in the report include a list of bench marks established.

The reclamation of waste lands in the Netherlands (*Verslag. en Meded. Dir. Landb. Dept. Landb., Nijv. en Handel, 1908, No. 6, pp. 7–82*).—Detailed statistics of the reclamation of such lands are given. These show that from 1897 to 1907, 90,440 acres of waste land were reclaimed in the Netherlands, nearly one-third of which was wooded land and the remainder arable and grass land; 1,390,000 acres were still unreclaimed in 1907.

The principal causes of the awakened interest in the work of reclamation are the more extensive use of artificial manures, the extension of agricultural and silvicultural knowledge, the higher prices of agricultural products, and the greater interest in everything connected with agriculture and reclamation.

The economic effect of this reclamation work has been to increase the rate of wages and to reduce the number of unemployed in winter. Agriculture has benefited by the acquisition of more grass land.

The author takes up the various provinces and discusses the kinds of waste lands, the purposes for which reclamation is carried on, the manner of reclamation, the circumstances which help or hinder the work, the results and their influence.

The Netherlands Moor Society has had a large share in the work of reclamation.

Reservoirs for irrigation, water-power, and domestic supply, J. D. Schuyler (*New York and London, 1908, 2. ed., rev. and enl., pp. XXVI+573, pls. 7, figs. 381*).—This is a second edition (E. S. R., 13, p. 194) in which the contents have been revised and considerably augmented by new material. Hydraulic-fill dams are treated more fully, there being over 100 pages, including illustrations, devoted to the subject. There are two new chapters, one on reenforced concrete dams, and one on structural steel dams. Another addition is a set of profiles of the leading and better known masonry dams, drawn to a uniform scale for graphical comparison.

Farm methods of applying land plaster in western Oregon and western Washington, B. Hunter (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 22, pp. 14, figs. 10*).—This discusses briefly the quantity of plaster to apply for the best results and the saving effected by a careful and uniform distribution. The larger part of the circular is occupied by a description of three implements used by farmers for distributing plaster, showing the construction in detail, with drawings.

The value of land plaster in increasing the yield of leguminous crops in this section of the country, the benefits of uniform distribution, and the way to secure this by the use of implements are briefly discussed.

Trials of potato and beet harvesters, 1907, C. V. Birk and M. Dall (*Tidsskr. Landökonom., 1908, No. 6, pp. 337–350*).—Three potato harvesters, one potato plow, and three beet harvesters were included in the trials. Descrip-

tions of the machines with illustrations, and the conclusions of the judges with reference to their merits are given in the case of each machine.

Trials of self-binders and mowing machines at Constantinsborg, 1908, M. Dall (*Tidsskr. Landökonom., 1908, No. 12, pp. 585–615*).—Several machines of different manufacture were tested in cutting rye and oats and the amount of power required was determined. In addition, trials were made of five types of combined grain harvesters and mowing machines.

The repair of farm equipment, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 347, pp. 32, figs. 23*).—The tools, materials, and facilities required for making repairs on all parts of the farm equipment are listed and described, with practical suggestions as to selection and use of tools and materials, and arrangement of a workshop. A few practical suggestions are given with a view to emphasizing the increased efficiency resulting from keeping equipment in good repair.

Handbook of farm buildings, ponds, etc., T. Winder (*London, Sheffield, and Glasgow, 1908, pp. 171, figs. 111*).—This volume treats of farm buildings and their appurtenances according to English practice, with practical suggestions resulting from the author's experience. Data relative to the design, construction, repair, and maintenance of farm buildings form the nucleus of the book, with chapters on drainage, materials, houses for farm animals and implements, and yards, walks, and gates. There is also a chapter by J. W. Beauchamp on electricity as applied to agriculture, which discusses the various appliances which can be operated economically by electricity and the means of obtaining the power as suited to individual cases.

The King system of ventilation, C. A. Ocock (*Wisconsin Sta. Bul. 164, pp. 3–24, figs. 21*).—In this bulletin descriptions and detailed plans are presented which it is deemed are sufficient to enable farmers to install in barns this system of ventilation. The essential features of the system, which was proposed by King in 1889 (E. S. R., 2, p. 447), "are several inlet flues to distribute the pure air, and one or more foul air flues of adequate size to assure rapid removal of foul air."

The disposal problem in rural districts, S. B. Lake (*Mo. Bul. Ind. Bd. Health, 10 (1908), No. 10, pp. 120–124, figs. 2*).—In this paper the author points out the essential principles involved in the sanitary disposal of sewage and garbage, and presents a design for a garbage disposal plant with a description of its operation.

RURAL ECONOMICS.

Builders of an agricultural commonwealth, C. H. Poe (*So. Atlantic Quart., 8 (1909), No. 1, pp. 1–11*).—This article presents data relating to the economic development of the South by means of the growth of scientific agriculture, road improvement, and agricultural education.

The State agricultural committee of the Farmers' Union, W. L. Stallings (*South. Cult., 66 (1908), No. 24, pp. 14, 15*).—This article gives the membership and aims of the State agricultural committee of the Farmers' Union of Georgia.

The purpose of this committee is "to encourage among the membership of the union a greater interest in more scientific farming and the raising of home supplies on the farm, to the end that cotton and other money crops may be surplus crops." The committee proposes to disseminate information on scientific farming by means of bulletins, the holding of meetings similar to farmers' institutes, the preparation of newspaper articles, etc., to publish the results of a better system of farming as compared with those of former methods, and to

make Georgia farmers more self-sustaining and independent in order that they may cooperate in the marketing of their crops to greater advantage.

Some associations of agricultural importance, A. RAEYMAECKERS (*Ann. Gembloux, 19 (1909), No. 1, pp. 1–11*).—The author discusses the origin, development, objects, and present status of the most important agricultural associations and cooperative societies in Belgium with particular reference to their bearing on the nation's economic and social welfare. The following data show the status of these organizations at the close of 1907: Agricultural associations numbered 1,058 with 63,260 members; cooperative societies for the purchase of farm supplies 1,004, expending for this purpose about $4,615,120; cooperative dairies 497, doing a business valued at about $6,905,357; Raiffeisen credit banks 523, loaning about $657,970; and assurance societies 1,591, insuring live stock valued at about $26,870,752.

The cooperative principle in the organization of agriculture in Denmark, T. BRINKMANN (*Fühling's Landw. Ztg., 57 (1908), No. 20, pp. 678–694*).—The author discusses the position of Denmark with regard to the world's markets, its agricultural possibilities and conditions, the number and size of its holdings, and other features of its economic life which have had a bearing on the development of the cooperative organization of agriculture in that country. The cooperative production and marketing of products are almost entirely limited to three fields—milk products, eggs, and bacon. The bulk of these products are shown to be raised on small holdings where marketing with profit would be impossible without cooperation, and the growth of the movement among the small farmers has resulted not only in developing the highest forms of agricultural cooperation to be found in Europe, but also has contributed to the economic welfare and independence of the Danish peasant class.

Jubilee of the Imperial Union of German Agricultural Cooperative Societies (*Dept. Agr. and Tech. Instr. Ireland Jour., 9 (1908), No. 1, pp. 37–42; Natal Agr. Jour., 12 (1909), No. 1, pp. 44, 45*).—A summarized account of the history of agricultural cooperation in Germany and of the above organization in particular.

Statistics of the development and business of the cooperative societies are presented, from which it appears that on June 1, 1908, there were 21,959 in Germany, of which the credit societies numbered 14,675, agricultural societies 2,138, creameries 3,132, and miscellaneous 2,014. Of the entire number, 17,627 belong to the imperial union.

Farming on shares in the present system of rural economy, A. SERPIERI (*Bol. Quind. Soc. Agr. Ital., 13 (1908), No. 22, pp. 1028–1057*).—This paper describes the different forms of share farming in various sections of Italy, points out under what circumstances and conditions of land and labor this system offers the best economic and social results, and discusses the economic limitations of farming on shares in Italy. The transformation of share farming into the tenant system, it is believed, will probably be intensified in the future and will be to the advantage of the tenant class.

The paper is followed by detailed explanatory notes and a discussion.

Agriculture and the tariff in England, O. BÜHLER (*Landw. Jahrb., 37 (1908), No. 6, pp. 961–1050*).—This article discusses the governmental inquiry into the agricultural conditions of England in 1906 and the significance of the land laws passed in 1907 for their improvement.

The agricultural holdings act, 1908 (*Gard. Chron., 3. ser., 45 (1909), Nos. 1149, pp. 11, 12; 1150, pp. 27, 28*).—This is a discussion of the act which took effect January 1, 1909, regulating the relations between landlord and tenant in England. The act repeals the market gardeners' compensation act of 1895, and the agricultural holdings acts of 1883, 1900, and 1906. The provisions relate to

compensation for improvements, arbitration, damage by game, freedom of cropping, compensation for disturbance, repairs to buildings, and record of condition at the time of commencing a tenancy. The text of the act has been previously noted (E. S. R., 20, p. 588).

Interim report of proceedings under the small holdings and allotments acts for the six months ending June 30, 1908, T. H. ELLIOTT (*Bd. Agr. and Fisheries [London]. Interim Rpt. Proc. Small Hold. and Allot. Acts, June 30, 1908, pp. 92*).

Holdings of farm laborers, DELIUS (*Landw. Wchnbl. Schles. Holst., 58 (1908), No. 52, pp. 890, 891*).—As a means of preventing rural depopulation, the author believes that the farm laborer must be established on the land, and that this can be done by the erection of suitable houses on land not less than ¼ hectare (about 0.31 acre) in extent, which property the laborer should have the privilege of purchasing. The cost of such holdings, the furnishing of funds by government and cooperative associations, and the moral and economic effects of ownership upon the laborer are briefly discussed.

Propositions regarding the improvement of the farm laborer, STIEGER (*Mitt. Deut. Landw. Gesell., 23 (1908), No. 45, pp. 391–394*).—This is a series of 36 propositions dealing with the conditions which should be put in operation for the educational, economic, and social improvement of the farm laborer and his family and their bearing upon the farm labor problem in Germany. The propositions relating to the moral and economic significance of piecework in agriculture have been previously noted (E. S. R., 20, p. 389).

Measures to be taken in the organization and management of farms to offset the lack of farm help, DYHRENFURTH (*Illus. Landw. Ztg., 28 (1908), No. 97, pp. 829–831*).—In addition to advocating the laying down of arable land to pasture and the raising of live stock in districts where farm labor is scarce, the author discusses from personal experience his method of farm management. This consists in the winter utilization of men and animals for work usually performed in the spring, the planting of winter crops and crops which follow each other in order of maturity, the greater use of machinery, the performance of many kinds of farm labor by piecework, etc. In this way his 4 farms have been operated with a less number of laborers and horses than would be possible under conditions which usually prevail throughout Germany.

The rights of employers when farm laborers break their contracts, SCHUMACHER (*Deut. Landw. Presse, 35 (1908), No. 98, pp. 1021, 1022*).—The rights of farmers according to the laws of Prussia and the Rhine Provinces, in cases where farm laborers break their contracts, are presented and discussed.

[Mexican farm laborers in the United States], V. S. CLARK (*Bur. of Labor [U. S.] Bul. 78, pp. 482–485*).—Notes are given on the number, distribution, kinds of labor in which employed, wages, mode of life, and social habits of Mexican farm laborers in the United States.

"The main value of the Mexican in agriculture is as a temporary worker in crops where the season is short, especially in harvesting cotton, grain, and sugar beets. Mexicans are not likely to be employed the year round by small farmers, because they are not entertained in the family like American, German, Scandinavian, or Irish laborers of the North. Yet they do not occupy a position analogous to that of the negro in the South. They are not permanent, do not acquire land or establish themselves in little cabin homesteads, but remain nomadic and outside of American civilization."

Agricultural imports of the Netherlands (*U. S. Dept. Agr., Bur. Statis. Bul. 72, pp. 53*).—Tabulated data of the imports of the Netherlands for the 10-year period 1897–1906, with special attention to agricultural imports and the proportion of these products furnished by the United States, are reported. The

total imports from the United States in 1906 were valued at $126,620,800, of which $72,791,316, or 57.5 per cent, were agricultural products, as compared with an average for the 10-year period of 62.2 per cent.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 11 (1909), No. 3, pp. 17–24*).—Statistics on the condition, value, yields, and prices of principal crops in the United States and foreign countries are tabulated and discussed, together with articles on the adulteration and misbranding of the seeds of alfalfa, red clover, orchard grass, and Kentucky bluegrass (noted elsewhere in this issue), and on the quantity and value of the imports of tobacco into England from the thirteen American colonies 200 years ago.

AGRICULTURAL EDUCATION.

Annual report Winnebago County schools, 1908, O. J. Kern (*Rockford, Ill., 1908, pp. 96, figs. 92, dgms. 2*).—This report classifies and describes the "forces at work" in country life under the heads of better physical conditions of the farm home, better farm management, transportation and communication for the farm, farmers' organizations and civic associations, the printing press, the country church, and the country school. There follows a chapter on outdoor art for country life, including directions for school gardening and a synopsis of such work done in the county in 1908, and a chapter on indoor art for country life similarly exemplified. One important division of the report is a classified list of the books available in the Rockford (Ill.) Public Library on country life interests, including the farm and home, country schools, industrial training, the studying and teaching of agriculture, and occupations and amusements. Such a classification of the books in local libraries would make them much more useful to teachers, and this report will be found helpful and suggestive to any planning for such classification. Seven pages are devoted to a review of the development of country high school work in Winnebago County, and some examples of recent consolidation in Ohio, and several pages on the Babcock milk tester as an educational and economic factor in a school are offered to illustrate "some ways a city high school may enrich country life."

The farmers' school, A. B. Graham (*Ann. Rpt. Ohio Bd. Agr., 62 (1907), pp. 412–421*).—This address reviews the history of rural school supervision in Ohio and dwells upon the provision made in recent years for the promotion of rural children to the opportunity for secondary training. The author also suggests many agricultural applications of the facts and principles learned in science study and points out the opportunities for making school work the center of social interest and activity in each community. Special emphasis is laid upon the importance of securing the best possible teachers for the rural schools.

The successful farmer's education, W. G. Owens (*Ann. Rpt. Penn. Dept. Agr., 13 (1907), pp. 224–228*).—The needs of the modern farmer for instruction concerning up-to-date machinery and other special features of agriculture are pointed out, the importance of agriculture as an industry is emphasized, and the need of starting instruction in agriculture in the public schools is insisted upon.

Higher education for the farmer's wife, Mrs. F. M. Jones (*Ann. Rpt. Ohio Bd. Agr., 62 (1907), pp. 456, 457*).—This paper makes an earnest plea for the introduction into the rural home of domestic time-and-labor-saving conveniences comparable in value with those which the farmer commonly provides himself with for the out-door work of the farm, that the energy thus saved to the wife may be utilized in the better organization of the entire home life and in assist-

ing her to wholesome social leadership for the betterment of the whole community.

One woman's work for farm women, JENNIE BUELL (*Boston, 1908, pp. 78*).—This is a biographical sketch of the late Mary A. Mayo, dealing with her work in rural social movements, especially through the grange and in the women's sessions of farmers' institutes in Michigan. In the latter work Mrs. Mayo was the first woman leader.

Agriculture in rural schools, A. M. DUNTON (*Northwest. Agr., 24 (1909), Nos. 6, pp. 7, 8, figs. 7; 7, p. 3*).—An article on the development and influence of the agricultural high school at McIntosh, Minn.

The Home Gardening Association (*Ann. Rpt. Home Gard. Assoc. [Cleveland], 9 (1908), pp. 34, figs. 19*).—A report of the year's activities of this association laying special emphasis upon the work of the "training garden" begun experimentally in 1906. This aims to give boys "practical experience in the preparation of the soil, the selection and planting of seed, the rotation of crops, and the sale of the produce" of school gardens. An important educational feature of this plan is the keeping of an individual "garden diary" of all work done and produce sold. Such a diary, with experiments performed, is presented.

School gardening and nature study in English rural schools and in London, SUSAN B. SIPE (*U. S. Dept. Agr., Office Expt. Stas. Bul. 204, pp. 37, figs. 15*).—This is a report upon some studies of methods of teaching nature study and school gardening in England conducted by the author in connection with a recent visit to Europe. An account is given of the nature-study book in the schools of Whitechapel, London, including a roof garden, nature-study museum, country-in-town exhibition, and a school nature-study union; nature study at the Kentish Town Road School, London; rural school gardens, including the work of agricultural inspectors, and evening and day school gardens; and teachers' courses and examinations, including summer courses, at the Horticultural College, Swanley, Kent.

A manual for high schools with special reference to science and agriculture, J. MAIN (*Knoxville, Tenn., 1909, pp. 32, figs. 6, map 1, dgm. 1*).—This is a tentative scheme for working out a practical and pedagogical correlation between agriculture and the other subjects commonly included in a good high school curriculum, with special reference to the work in natural and physical science. One of the leading aims in the plan is to bring forward each successive phase of agriculture at the season when it may be both of the highest psychological interest and greatest practical value. The manual includes an elaborate course of study, detailed plans for an agricultural school library, and a list of required laboratory equipment.

Teachers' manual of elementary agriculture, nature study, and domestic science (*Boston and London, 1908, pp. 117, pl. 1, figs. 5*).—This manual has been prepared under the direction of the Colorado Teachers' Association, and is introduced in a foreword by F. E. Thompson, of the Colorado State University, which contains a statement of the teacher's problem in the rural schools, with general and specific suggestions toward its solution. There follow brief chapters on soils, plant life, school gardening, field crops, insects and birds, live stock, and domestic science, each prepared by a specialist. The manual closes with a bibliography for agricultural and nature-study work.

Public school agriculture, 1909 (*Mass. Agr. Col., Dept. Agr. Ed. [Pamphlet], 1909, pp. 32*).—This pamphlet is the work of a committee appointed at the close of a conference on agricultural science at Amherst, Mass., in 1908, to prepare a series of teachable exercises on elementary agriculture. The exercises proposed number 54, distributed over the study of soils, capillarity, drainage, evaporation,

earthworms, plant transpiration, fertilizers, leguminous forage plants, seed selection, corn germination, plant variation, propagation, grafting, pruning, Bordeaux mixture, milk bacteria, milk testing, etc. Twenty-four additional exercises are suggested, with a list of helpful bulletins and books.

Course in nature study and elementary agriculture for the ungraded schools of California, R. O. Johnson (*[Chico, Cal., 1909], pp. 6*).—This is an outline for work in the ungraded schools, and includes some suggestions concerning the administration of a course in nature study and elementary agriculture, together with a specimen lesson concerning the cow.

The study of the evergreens in the public schools, C. M. Weed (*Boston: State Forester, 1908, pp. 30, figs. 8*).—A brief manual for teachers who wish to use the common evergreens for nature-study work at a season when deciduous plants are not available. It furnishes detailed and practical directions as to methods of study in the public school, a suggested list of trees appropriate for consecutive grades, the preparation of solar prints, and feasible correlations with other lines of grade work.

Syllabus of illustrated lecture on the production and marketing of eggs and fowls, J. Dryden (*U. S. Dept. Agr., Office Expt. Stas., Farmers' Inst. Lecture 10, pp. 20*).—This lecture deals with egg production, housing of fowls, feeding of fowls, poultry in the orchard, incubation, fattening chickens, marketing product, and insect pests. Forty-four lantern slides have been prepared to illustrate the lecture, and a list of references to poultry literature is given.

Annual report of farmers' institutes, 1908, T. Butler (*Bul. N. C. Dept. Agr., 29 (1908), No. 10, pp. 71, figs. 2*).—In addition to the report on the work of the men's and women's institutes, the bulletin contains lectures delivered at women's institutes, the programme of the Farmers' State Convention, lectures delivered at the women's meeting of that convention, and an account of the development of the dairy interests in the State under the influences of the National and State departments of agriculture, the State Dairymen's Association, the dairy department of the North Carolina College of Agriculture and Mechanic Arts, and the individual efforts of dairymen.

Organization lists of the agricultural colleges and experiment stations, Mary A. Agnew (*U. S. Dept. Agr., Office Expt. Stas. Bul. 206, pp. 114*).

MISCELLANEOUS.

Annual report of the director for the fiscal year ending June 30, 1908 (*Delaware Sta. Bul. 84, pp. 3–12*).—This contains the organization list of the station, a report of the director discussing the function, personnel, work, equipment, and needs of the station, and a financial statement for the fiscal year ended June 30, 1908.

Biennial Report of Iowa Station, 1902–3 (*Iowa State Col. Agr. Rpt. 1902–3, pp. 22, 23, 25, 26, 33, 34, 36–38, 54–60, 68, 73, 88, 92, 117*).—Extracts from the reports of the president of the college, the treasurer, and secretary pertaining to the station are given, including notes on its work and publications, and a financial statement for the fiscal years ended June 30, 1902, and June 30, 1903.

Biennial Report of Iowa Station, 1904–5 (*Iowa State Col. Agr. Rpt. 1904–5, pp. 54–57, 64–67, 90–95, 104*).—This contains a report of the director of the station, a financial statement for the fiscal years ended June 30, 1904 and June 30, 1905, and a summary of the bulletins issued during that period.

Annual Report of Iowa Station, 1906 (*Iowa State Col. Agr. Rpt. 1906, pp. 60–65, 68*).—This contains a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1906.

Twenty-first Annual Report of Michigan Station, 1908 (*Michigan Sta. Rpt. 1908, pp. 115–410*).—This contains a financial statement for the fiscal year ended June 30, 1908; reports of the director and heads of departments on the work of the station during the year, the experimental features of which, together with several special articles and reprints of Special Bulletins 45 and 46, are noted elsewhere in this issue; and reprints of Bulletins 248–251, and of Special Bulletins 38, 39, 42, and 43, previously noted.

Twenty-sixth Annual Report of New York State Station, 1907 (*New York State Sta. Rpt. 1907, pts. 1, pp. IX+456; 2, pp. XV+564; 3, pp. VII+362*).—This report is issued in 3 volumes. Part 1 contains the organization list of the station, a financial statement for the Federal funds for the fiscal year ended June 30, 1907, and for the State funds for the fiscal year ended September 30, 1907, a list of the periodicals received by the station, meteorological observations noted on page 913 of this issue, reprints of Bulletins 286–290, 292, 293, and 295, Technical Bulletins 4–6, and Circular 8, all of which have been previously noted, and an index to the first 25 annual reports of the station. Part 2 is made up of The Grapes of New York, and is noted on page 940 of this issue. Part 3 contains an extended review of the work of the station for the first 25 years, including an account of the twenty-fifth anniversary exercises. The summaries of the experimental work are noted elsewhere in this issue.

Director's report for 1908, W. H. Jordan (*New York State Sta. Bul. 310, pp. 559–579*).—This contains the organization list and a review of the work and publications of the station for the year.

Seventeenth Annual Report of Oklahoma Station, 1908 (*Oklahoma Sta. Rpt. 1908, pp. 80*).—This contains the organization list, a report of the acting director and heads of departments on the work of the station, a list of the station publications available for distribution, a brief digest of the station publications issued during the year, and a financial statement for the fiscal year ended June 30, 1908.

The press bulletins summarized are in part a repetition of matter published in the regular bulletins of the station. Those not noted elsewhere in this issue are entitled Protecting Trees from Rabbits, Setting Trees, Vaccinate for Blackleg, and Bee Culture in Oklahoma.

Twenty-fourth Annual Report of the Bureau of Animal Industry, 1907 (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1907, pp. 486*).—This includes a report of the Chief of the Bureau for the fiscal year ended June 30, 1907, numerous articles abstracted elsewhere in this issue or previously noted, and a list of the publications of the Bureau during 1907. An appendix contains the rules and regulations of the Secretary of Agriculture relating to animal industry issued in 1907.

Report of committee on station organization and policy, H. J. Wheeler et al. (*U. S. Dept. Agr., Office Expt. Stas. Circ. 82, pp. 10*).—This report was presented to the Association of American Agricultural Colleges and Experiment Stations at the convention held at Washington, D. C., November 18–20, 1908, and has been noted editorially (E. S. R., 20, p. 303).

Index to the Yearbooks of the United States Department of Agriculture, 1901–1905, C. H. Greathouse (*U. S. Dept. Agr., Div. Pubs. Bul. 9, pp. 166*).—This is a combined subject and author index in continuation of work previously noted (E. S. R., 14, p. 509).

NOTES.

Colorado College and Station.—The legislature has appropriated $119,000 for the ensuing biennium, of which $40,000 is for the completion and equipment of a building for instruction in civil and irrigation engineering, and the remainder for farmers' institutes and station work. A bill was also passed establishing a substation at Cheyenne Wells.

L. M. Taylor has been elected secretary of the State board of agriculture, vice A. M. Hawley.

Connecticut College.—The eighth annual session of the summer school will be held during the four weeks beginning June 29. Courses in nature study, domestic science, agriculture and methods of teaching elementary agriculture have been planned to meet the needs of teachers, especially those in rural schools, as well as of others interested in nature and country life. Special practical courses in poultry husbandry and fruit growing will also be given.

Hawaii Federal Station.—The special agent in charge has been appointed by the governor of Hawaii a member of two special boards provided for at the recent session of the legislature. One of them is on the allotment of a special tax known as the Natural Resources Conservation Tax, and the other a commission to investigate fruit growing and truck farming in that Territory.

An exhibit of station work was made at the recent poultry exhibition, special prominence being given to the work under way with cotton, tobacco, rubber, and rice, and to bee keeping.

Iowa College and Station.—A single board of education has been established by the legislature to control the college and station, the State university, and the State normal school, which have hitherto been governed by separate boards. This board consists of nine members appointed by the governor for terms of six years each, its personnel being as follows: A. B. Funk, Spirit Lake; James E. Trewin, Cedar Rapids; P. K. Holbrook, Onawa; Roger Leavitt, Cedar Falls; C. R. Brenton, Dallas Center; T. D. Foster, Ottumwa; E. T. Schoentgen, Council Bluffs; D. D. Murphy, Elkader; and George T. Baker, Davenport. Of these, C. R. Brenton was a member of the former board of trustees of the college. A finance committee is to be selected by the board from outside its own membership, which will give its entire time to the business management of the institutions.

Kansas College and Station.—W. A. Harris, of Lawrence, Arthur Capper, of Topeka, and W. J. Todd, of Maple Hill, have been appointed to the board of regents, vice J. S. McDowell, A. M. Story, and G. P. Griffith. At a recent meeting of the board the horticulturist was appointed to the newly established office of State forester. The purchase of two quarter sections of land northwest of the college farm was authorized.

Maine Station.—An act has been passed by the legislature requiring the station to conduct investigations in orcharding and the growing of corn and other farm crops, and appropriating $10,000 for the purchase and equipment of a suitable farm for such work.

Michigan College and Station.—Extension work in animal husbandry, begun by the college about a year ago through the appointment of F. W. Raven as field agent, has met with encouraging success. Efforts have been directed mainly toward the organization of cooperative breeders' associations, with a view to the stimulation of live-stock improvement. During the first 6 months 10 associations were formed, representing 2,100 cows, and 51 registered sires were purchased. O. K. White has recently been appointed field agent in horticultural extension work, and A. R. Potts for similar work with soils and field crops.

William S. Sayer, assistant in bacteriology in the college and research assistant in bacteriology in the station since 1907, was drowned while canoeing April 30. He was graduated from Beloit College in 1899, and engaged in graduate work in the University of Chicago for the two years following. He had served as chemist and bacteriologist to the Chicago Sanitary Commission, and later was in commercial work. He was 33 years of age.

Maryland College and Station.—Frank Kent has been appointed registrar and treasurer of the college and treasurer of the station, vice the late Dr. J. R. Owens.

Mississippi College.—The corner stone of the new administration building, to cost approximately $100,000, was laid April 16, with appropriate exercises. The principal address was delivered by President W. O. Thompson, of the Ohio University, who took for his subject Industrial Education.

Nebraska University and Station.—According to a note in *Science*, the charter of the university has been amended by the legislature to allow a reorganization into seven colleges, namely: The graduate college, the college of arts and sciences, the college of agriculture, the college of engineering, the teachers' college, the college of law, and the college of medicine. Of these the graduate college has hitherto been known as the graduate school, and the colleges of agriculture and engineering have constituted what was known as the industrial college.

An appropriation was made by the legislature of $45,000 for substations, $20,000 for farmers' institutes, and $100,000 for permanent improvements, the purchase of additional land, and other purposes.

Cornell University.—*The Rural New Yorker* announces that the College of Agriculture is to cooperate with the Chautauqua Institution in holding a country life week at Chautauqua, August 23 and 24. This will take the form of a general conference of all persons interested in country life with a symposium on its problems, both by men in close touch with country life and those prominent in other activities. It is expected that many of the agricultural colleges and schools of the country will be represented.

New York State Station.—A State appropriation of $10,000 has been granted for a study of grape production in Chautauqua County. The investigations are to include methods of culture and the ravages of insect pests and fungi.

Ohio University and Station.—The legislature has appropriated $20,000 to amplify the extension work of the university through the holding of traveling schools of agriculture. These schools are restricted in duration to one week, and not more than one school may be held in a county during a given year. Instruction is to be offered in soil fertility, stock raising, crop production, dairying, horticulture, domestic science, and kindred subjects. An agricultural train was sent out March 23, which made a 5-day trip through the southwestern part of the State.

Arrangements are being made to supplement the variety tests of wheat under way at the station with milling and baking tests, and C. G. Evans has been appointed assistant agronomist to have charge of this work.

The vestry of a church in Boardman, Mahoning County, has offered to the station the use of a tract of 10 acres for a test field, and the county commissioners and county agricultural society of Hancock County have made a similar offer of a tract of 20 acres. These offers have been accepted and work on the fields has been begun.

The calls for the station's fair exhibit from county fair associations have become so urgent that two exhibits will be put in the field during the coming fair season, the routing of the exhibits being placed in the hands of a committee of the fair associations.

The State appropriations to the station aggregate $118,990, besides $1,000 for stationery and an unrestricted amount for paper for publications. The appropriations include $28,500 for administrative purposes, $9,500 for agronomy, $15,150 for animal husbandry, $5,000 for botany, $15,600 for cooperative experiments, $6,950 for entomology, $8,000 for forestry, $8,000 for soils, $3,650 for chemistry, $9,640 for horticulture, $8,000 for nutrition, and $1,000 for equipment.

Oklahoma College and Station.—A very successful week's short course was held at the college in January. About 400 farmers were in attendance, and 50 women attended the course in domestic economy. The subjects presented included cotton, corn, and alfalfa growing, seed selection, road building, farm management, horse and swine judging, dairying, tuberculosis, Texas fever and its eradication, the silo and its uses, care of farm horses, orchard pests and spraying, fruit growing and storage, and tree planting. A special feature of the week was a meat-cutting demonstration, conducted under a large tent in which all the retail cuts of beef, pork, and mutton were shown and their relative value explained.

The State Dairymen's Association held its annual meeting during the week, and a corn growers' association was organized with over a hundred charter members.

Extension work is contemplated through a boys' and girls' agricultural club and cooperative experimental work among former students of the college. Several new buildings for the college and station are to be erected.

John F. Nicholson, professor of botany, entomology, and geology in the college and entomologist in the station, resigned February 10 and is engaged in commercial work.

Pennsylvania College and Station.—The Pennsylvania Railroad recently arranged a special trip to the college for a company of 23 of its local station agents, for a day's study of agricultural matters of benefit to the farmers in the districts tributary to their stations. H. P. Baker, forester, has been granted leave of absence for 18 months, beginning July 1, to be spent in study and travel in Europe and the Orient.

Rhode Island College and Station.—By a recent act of the general assembly, the board of managers has been increased by the addition of the State commissioner of education and a representative to be elected from the State board of agriculture. It is expected that this change will bring the institution into closer touch with the general agricultural work of the State, and that it will tend to promote cordial relations between the board and the State board of agriculture.

Tennessee University and Station.—The legislature has passed a bill giving 25 per cent of the State's revenues for education. Of this amount 7 per cent will go to the university and experiment station—$10,000 being set aside for the support of the substation at Jackson, $5,000 for crop experiments in middle Tennessee, $7,500 for the station at Knoxville, and the remainder, at present about $40,000, for instruction at the university.

W. K. Hunter has been appointed fertilizer and food chemist, vice W. E. Grainger. J. E. Hite, assistant in cooperative experiments at Gallatin, is no longer connected with the station.

Virginia College and Station.—Since November 1 five agricultural trains have been sent out over as many different railroads, with an aggregate attendance of about 25,000 people or about 100 at each stop. At least two more trains are contemplated before June 1. The college and station are to furnish speakers and experts for two cars, one of which will be for live stock. In return the railroads have agreed to run farmers' excursion trains along their lines to the college during the summer.

The dairy division is now installed in its new quarters in the basement of the new agricultural building. Its equipment is considered second to none in the South. There is a commercial creamery room 90 by 90 feet, with complete equipment, especially for the production of high-grade cream; a farm dairy and butter-making room 90 by 90 feet, with most of the standard separators and churns; a pasteurizing room 30 by 20 feet, containing a duplex pasteurizer driven direct by motor; a bottling outfit; a wash room isolated from the creamery, with sterilizing apparatus; a room 20 by 20 feet, containing a brine tank with freezing capacity of 1¾ tons of ice in 36 hours; 4 cold storage rooms, 2 for bottling, 1 for cream, and 1 for cheese, insulated with cork and refrigerated with the ammonia absorption system; a laboratory for dairy bacteriology 15 by 20 feet; a milk-testing laboratory and lecture room 90 by 90 feet, completely equipped for 32 students, with room for 70; and a cheese room 90 by 90 feet. All the rooms have cement floors with center drain, and all machinery is run by electric motor.

E. B. Fred, assistant bacteriologist in the station, has been granted a year's leave of absence to be spent in the study of soil bacteriology in Germany.

Virginia Truck Station.—Recent changes in the governing board include the appointment thereto of J. M. Barker, of Axton, vice J. W. Churchman, deceased, and of N. W. Nock, of Onancock, vice C. W. Heater, and the selection of President P. B. Barringer, of the Virginia College, as president of the board.

Wisconsin University and Station.—In addition to the editing of all publications of the college and station, the new editorial office is to serve as a press bureau for the preparation of data to be sent out to newspapers of the State and the agricultural press of the country. A press bulletin containing news notes and articles on work of the college and station is being issued weekly by the university.

Recent appointments in the college of agriculture include Ward M. Totman as assistant in dairy husbandry, and Fred L. Musback as assistant in soils, vice M. I. Tuttle and Roy R. Marshall, resigned.

The station is again preparing to conduct spraying demonstrations for potato blight and cranberry diseases in cooperation with farmers in the State.

New York Conference on Secondary Agricultural Schools and Branch Experiment Stations.—At a conference of deans of the various State agricultural schools, held at Cornell University during Farmers' Week, the function and scope of the secondary agricultural schools was discussed. The consensus of opinion favored so conducting such schools as to fit their graduates primarily for practical farm work and secondarily for teaching agriculture. The correlation of all such work into a general State system was advocated as was also the passage of legislation providing for the establishment of agricultural instruction in the public schools on a basis similar to the trade schools founded in 1908.

With reference to branch experiment stations, for which there is considerable agitation in the State, the decision reached was adverse to the establish-

ment of such stations as regards the buying of land and erecting permanent buildings. It was agreed that field laboratories and temporary stations might be established to solve individual problems and maintained until a solution of these problems was reached.

Alfred University State School of Agriculture.—The *Buffalo* (N. Y.) *News* of April 7 announces that the legislature has appropriated $40,000 for the buildings and equipment of the New York State School of Agriculture at Alfred University, Alfred, N. Y. Of this sum $5,000 is immediately available for the purchase of live stock, dairy supplies, and improvements on the State farm.

Agriculture in Public Schools.—The *Fairmont West Virginian* of March 31, 1909, states that the legislature has passed a bill requiring West Virginia teachers to pass an examination in agriculture for any grade of certificate.

Michigan Farmers' Short Course.—The second annual farmers' short course conducted by the Menominee (Mich.) County Agricultural School, March 16 to 19 was remarkably successful, no less than 2,500 persons being enrolled from adjacent counties in Michigan and Wisconsin.

Traveling Stock-judging Schools in Canada.—A new feature in farmers' institute work was attempted last year in the Province of Alberta, viz, traveling stock-judging schools. Two cars with about 50 head of improved stock, loaned by the Lacombe Agricultural Society and leading stockmen of the province, were carried from place to place throughout the province and used for demonstration purposes. In selecting the stock the object was to have the popular breeds of horses, cattle, sheep, and swine represented. Owing to the risk in carrying the animals on the train for 3 months they were insured, and at each place were stabled in livery barns. A hostler and two herdsmen accompanied the stock.

Nine schools, of 1 or 2 weeks' duration, were held in comfortable class rooms, and from 4 to 6 speakers took part in the program at each place. At the close of each school a judging contest, open only to the members of the school, was held and prizes were offered. A membership fee of $1 was charged, the money being used for fitting up the class room and for prize money. The scheme is reported to have been highly successful.

New Journals.—*Zeitschrift für biologische Technik und Methodik* is being issued at regular intervals under the direction of Dr. Martin Gildemeister, of Strassburg. It is to contain short original articles in the German language and original descriptions, notes, and abstracts of articles dealing with biological apparatus and methods. Special attention is to be given to plant and animal physiology, physiological chemistry, bacteriology, fermentation chemistry, pharmacology, and experimental pathology, psychology, and morphology.

The American Pure Food and Drug Journal, "devoted to the enforcement of the National and State pure food and drug laws," is being issued as a monthly. The initial number contains the text of the National food and drug act and of the West Virginia pure-food law, inspection rulings by State authorities in Ohio and Kentucky, an account of legal cases arising in the enforcement of the National act, articles discussing various pure-food questions, and other data.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

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CONTENTS OF VOL. XX, NO. 11.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

Stations in the United States.

Stations in the United States—Continued.

U. S. Department of Agriculture.

NOTE.—The publications of the United States Department of Agriculture, except those of the Weather Bureau, may be purchased from the Superintendent of Documents, Washington, D. C. For the publications of the Weather Bureau requests and remittances should be directed to the Chief of the Bureau. The price of *Experiment Station Record* is $1.50 per volume, or 15 cents per number. The prices of other technical publications are given above. The publications of the State experiment stations are distributed from the stations and not from the Department.

EXPERIMENT STATION RECORD.

VOL. XX. JUNE, 1909. No. 11.

The list of projects conducted by the experiment stations under the Adams fund includes sixty-three which fall under the head of investigations in breeding. This relatively large number indicates the popularity of the subject, and an evident feeling that it not only presents large research possibility but is a line in which investigation is greatly needed.

The attention which is being given to breeding is encouraging, and the number of enterprises suggests the possibility of material additions to the general understanding of its various phases. As the Adams fund is known to be for work of research character, this expectation seems a reasonable one, for it implies a grade of work which is systematic and thoroughgoing, and will be continued to a definite conclusion. The men who have enlisted under that fund therefore have a certain responsibility resting upon them for the maintenance of a high standard of investigation, and for the character of the results which they secure. Like all Adams fund workers, their scientific reputation is at stake, and their conceptions of research as well as their ability in that line will be judged by the direction which their work takes. This will depend ultimately upon the attitude in which the man in charge approaches the subject, and the direction in which his real interest lies. It may be modified for a time by external influences, but in the end it will, like all investigation, be the product of the man.

Quite wide differences still exist in the conception of research and original investigation as applied to breeding. The subject is alluring on account of the practical possibilities it presents. Popular interest in the results of selection and breeding has led some men into it whose main interest apparently centers around the thing to be produced rather than the method or the phenomena involved. There is a failure to distinguish between the scientific or research phases and the practical phases of plant breeding—between the search for truth and the production of a material thing.

The subject of breeding presents many excellent opportunities for research, but the breeding of plants and animals by experiment stations or by practical breeders is not necessarily of that grade. The study of principles and the broadening of knowledge as to how desired results may be secured is one thing, and the intelligent application of such knowledge in the improvement of existing varieties is another. It is for the worker to determine which line he will undertake. Not all of the breeding work is necessarily confined to the research fund—in fact, only such as involves actual research features is appropriate to it. There is a place for the more practical kinds of breeding work, provided it is not merely commercial and contains experimental features.

In a comparatively few cases does the breeding work of the stations actually deal primarily with underlying principles or methods: in some others it involves the more or less systematic study of phenomena observed in connection with the attempt to secure improvement, but in many cases the primary aim and the one largely influencing the conduct of the work is improvement in some particular by well-known methods, usually depending on the chance of favorable variation.

There is danger, therefore, that the expectations aroused by the number of undertakings in breeding may not be fully realized in the scientific output. This seems quite likely to be the case unless more scientific features are introduced. This emphasizes the necessity of recognizing the proper distinction between various kinds of effort, and applying the proper terminology. The terms "investigation" and "original research" have been used too loosely in reference to station work, and that practice is likely to bring a reflection on the scientific work in agriculture. These terms are not easily defined, being largely a matter of feeling and spirit, but they stand for fairly definite grades of work in the minds of scientific men.

Of the 63 breeding projects of the experiment stations, only 11 relate to the breeding of animals. The small number of the latter is perhaps natural, both from the cost of animal experiments and the number of men who are especially interested in that phase of breeding studies. The subject is more complex because animals are more highly organized than plants and greater time is necessary to secure results. It is believed, however, that more investigation could profitably be undertaken in that line, but investigations of insufficient extent and thoroughness are to be discouraged.

There are several quite large projects being carried on by the stations, and in addition to these there are a number conducted under other auspices, notably by Davenport, under the Carnegie Institution, and by Castle, at Harvard. The field is a most appropriate one to the agricultural experiment stations and to the Adams fund,

especially if this fund can be supplemented by State funds so as to insure the conduct of the investigation on a sufficiently large scale. It affords excellent opportunity for the exercise of research ability and for investigation of the first rank. The results are needed not only for their practical application but as a basis for teaching. Breeding studies must go on in connection with the attempt to secure economy of production through the development and perpetuation of more efficient machines for converting food into products and the securing of greater special adaptation.

From being largely a matter of good judgment of animals, successful breeding has come to have a more substantial basis in science. Bakewell's good judgment of stock enabled him to develop the Dishley breed of sheep and the Longhorn breed of cattle. Every feeder knows that the individuality of the animal is an important factor in feeding problems. The characteristics of animals of the same species are subject to so great variations that it is necessary for the successful stockman to be a good judge as to what animals will make the most economical use of feeds. The past century has witnessed a great increase in the number of good judges of stock. Under the present training in our agricultural colleges the average student after a reasonable amount of experience can pick out the fit from the unfit. Good judges of stock are becoming more common. But given a pen of good animals, the problem before the breeder is how to perpetuate the good qualities—how can the ability to make an economical use of feed be carried over to the next generation?

Modern scientific investigation has contributed considerable light upon this point. Microscopic study of the germ cells and embryonic tissue has revealed the inner structure and the conditions which may influence the incipient organism. Biometric treatment of the phenomena of heredity indicates the degree to which in the long run a continuous variation may be inherited; and above all the discovery of Mendel's principles has made it possible to predict with a reasonable degree of certainty what characters may be inherited.

Experimental evidence has shown that the unit characters of which each individual being is composed may be inherited independently; that some of these units are dominant over others; that the recessive characters can be inherited as a rule only when mated with recessive; that all ancestors of the same degree do not contribute equally to the hereditary qualities of the offspring. Mendel and other investigators have proved that each character of an animal may be broken up into its separate factors by experimental work, and that definite knowledge may be obtained as to which characters blend and which are alternative; which are dominant and which are recessive.

Once these facts have been ascertained, the breeder is no longer working in a haphazard way. When Hurst can predict the difference between the result of mating two pairs of rabbits, externally identical, because he knows the difference between their gametic constitution, or Castle can prophesy a new variety of guinea pigs, as reported on another page of this issue, the breeder has it in his hands to accomplish his object more intelligently and with greater certainty.

Davenport, Hurst, Bateson, and others have found that poultry exhibits numerous unit characteristics which are inherited in alternative fashion, many of which when correlated easily separate as a result of hybridization. Davenport has recently found that the crest of canaries behaves in Mendelian fashion, as in the case of poultry and pigeons. Spillman has indicated how a knowledge of Mendelian characters may assist in fixing the white band and in eliminating the white feet of Hampshire swine without using black breeding animals. From a study of stud books Harper found that in Percheron horses the gray color is dominant over black, and the dam dominant over the sire in the ratio of five to four; and Hurst that the bay and brown colors of thoroughbred horses are Mendelian dominant over chestnut.

Most of the work done in the determination of Mendelian principles has been applied to morphological characters, but the practical man has more concern with physiological qualifications. If morphological characters behave in Mendelian fashion, there is reason to suppose that the physiological characters do likewise, although this has been determined in but few cases. For instance, normal mice are dominant over waltzing mice; and Hurst has found that, at least in some cases, broodiness in hens is dominant over nonbroodiness.

It has been the common opinion among farmers and stockmen that an acquired modification is inherited, but the study of cell division under the microscope indicates that functional variations are rarely if ever inherited, and that injuries and mutilations are not passed on. The lecture before the American Association for the Advancement of Science, at Baltimore, by Professor Wilson, reported on page 1071, is an illustration of how microscopic studies of germ cells may throw light upon the vexed problem of the determination of sex.

Results of applying the statistical methods, as elaborated by Quetelet, Galton, Pearson, and their followers, to the problems of heredity are too well known to be described here, but as yet their value seems to have been less appreciated by station workers in animal breeding than in plant breeding. The breeding of the larger domestic animals is slow and costly, but fundamental principles remain the same throughout the animal kingdom, and much can be done, at least in a preliminary way, by working with small animals which reach maturity in a few weeks or months. Though the primary interest may

be with horses and cows and the information sought is to be applied to their breeding, much time may be saved by experimental work with mice, guinea pigs, rabbits, and other prolific mammals.

The discovery of a dominant character in the color pattern of a rabbit may require many generations of rabbits but only a comparatively short space of time. Once discovered, the observations may be transferred to the horse to determine if the same character is dominant there, with a saving of much time. Such questions as the regulation of sex, telegony, maternal impression, and inheritance of acquired characters are of great interest to biologists and practical breeders alike. Small animals lend themselves to studies of this kind, and may give both theoretical results and practical indications. Recently much light has been thrown on the subject of the determination of sex by studies with moths, grasshoppers, the cherry bug, and other insects.

Conditions at some of the stations have been too unsettled to warrant the inauguration of a work which may take many years before appreciable results can be secured. The more stable conditions which now prevail, and the special research fund, offer many inducements for men who have the proper training and are content to work industriously and continuously along one line for a term of years.

With our present knowledge there seem to be three main lines which offer great opportunities: (a) Experimental breeding with discontinuous variations; (b) statistical study of continuous variations; and (c) microscopic study of the minute constituents of germ cells. Eventually we shall have to seek explanations for the phenomena of heredity in physiological chemistry and molecular physics, but for the present there is abundant opportunity for studying experimentally the problems which bear more directly upon the practical work of the breeder.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Agricultural chemistry, A. Morgen and G. Fingerling (*Jahrb. Chem., 17 (1907), pp. 285–299*).—This is a review for the year 1907, and, as usual, contains biographical notes, references to important discoveries in analytical methods, and a review of chemical investigations relating to air and water, soils, fertilizers, and plant and animal physiology.

Chemical industry in relation to agriculture, A. Frank (*Jour. Soc. Chem. Indus., 27 (1908), No. 22, pp. 1093–1100*).—This article shows the close relation between chemical industry and agriculture, particularly in the production of phosphates, potash salts, and nitrogen compounds. Especial attention is given to the progress and present status of the manufacture of nitrogen compounds from the air by electric processes.

The behavior of metallic aluminum in contact with milk, wine, and some salt solutions, F. von Fillinger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 4, pp. 232–234*).—An investigation undertaken with reference to the use of aluminum for cooking utensils showed that fresh milk did not dissolve an appreciable quantity of it, while the serum of very sour milk dissolved only traces. When wine was cooked in aluminum none of the metal was dissolved.

On the precipitation of magnesium as ammonium-magnesium phosphate, E. Raffa (*Gaz. Chim. Ital., 38 (1908), II, No. 6, pp. 556–566; abs. in Analyst, 34 (1909), No. 395, p. 73; Ztschr. Angew. Chem., 22 (1909), No. 9, pp. 397, 398; Jour. Chem. Soc. [London], 96 (1909), No. 556, II, pp. 183, 184*).—The author discusses conditions affecting the accuracy of the determination of magnesium by precipitation with sodium-ammonium phosphate.

A volumetric method is proposed as follows: To 40 cc. of half-normal sodium-ammonium phosphate in a wide-mouthed flask add rapidly 10 cc. of the solution in which magnesium (0.3 to 0.5 gm.) is to be determined; shake the mixture and allow to stand until precipitation is complete; filter through a dry filter or remove the clear liquid with a pipette. To an aliquot part of the solution add 1 to 2 cc. of concentrated acetic acid and determine excess of phosphoric acid by means of uranyl acetate in the usual way.

If a gravimetric procedure is preferred, the precipitated ammonium-magnesium phosphate (using 20 to 25 cc. of sodium-ammonium phosphate) may be collected on a filter, washed with 2.5 per cent ammonium solution, ignited, and weighed in the usual way.

The theory of the titrametric determination of phosphoric acid (*Pharm. Zentralhalle, 49 (1908), No. 51, pp. 1035–1037*).—The theory and calculation of results of precipitation as ammonium phosphomolybdate and ammonium magnesium phosphate weighed as magnesium pyrophosphate are briefly explained.

Volumetric determination of water-soluble phosphoric acid in superphosphates, L. Schucht (*Chem. Ztg., 32 (1908), No. 99, pp. 1201, 1202; abs. in*

Jour. Chem. Soc. [*London*], *96* (*1909*), *No. 555, II, p. 92; Chem. Zentbl., 1909, I, No. 3, p. 216; Chem. Abs., 3* (*1909*), *No. 7, p. 763*).—The perfected method proposed by the author is in brief as follows: In 500 cc. of a superphosphate solution containing 20 gm. to the liter, precipitate the lime with exactly the amount of normal potassium oxalate required (this is determined by previous titration of an aliquot of the solution), heat to about 70° C. until the granular precipitate falls to the bottom, cool in a stream of water, make the volume to 550 cc., filter, and titrate 110 cc. of the filtrate with one-half-normal alkali solution, using methyl orange or indigo methyl orange as indicator. To another portion of 110 cc. of the filtrate add 25 cc. of normal oxalate solution and titrate with the same alkali solution, using phenolphthalein as indicator. The difference between the number of cubic centimeters obtained in the two titrations multiplied by 0.0355 and by 50 gives the percentage of water-soluble phosphoric acid. The number of cubic centimeters obtained in the first titration multiplied by the same factors gives the percentage of free acid.

The determination of nitrogen in calcium cyanamid, D. Girasoli (*Atti R. Ist. Incoragg. Napoli, 6. ser., 59* (*1907*), *pp. 13, 14*).—The author reports a new method, easily executed, sufficiently exact, and time saving.

The calcium cyanamid is put into a glass tube connected on one side with a flask in which steam is produced and on the other side with a condenser. The tube is heated with a Bunsen lamp while steam is forced through and the distillate is collected in a flask containing a known quantity of tenth-normal sulphuric acid. The reaction is complete when the distillate no longer gives an alkaline reaction. The excess of sulphuric acid is titrated with a tenth-normal ammonia solution, using phenolphthalein as an indicator. A table is appended comparing the results obtained with 3 samples by this and the Kjeldahl method. A maximum difference of 0.13 per cent is shown.

Comparative determinations of hardness in water, Klut (*Mitt. K. Prüfungsanst. Wasserver. u. Abwässer. Berlin, 1908, No. 10, pp. 74–85; abs. in Chem. Ztg., 32* (*1908*), *No. 97, Repert., p. 632; Chem. Zentbl., 1908, II, No. 25, p. 1953; Jour. Chem. Soc.* [*London*], *96* (*1909*), *No. 556, II, p. 183; Gesndhts. Ingen., 32* (*1909*), *No. 16, pp. 270, 271*).—Gravimetric analysis is considered the only absolutely accurate method of determining hardness. For quick determination Clark's soap method has value. The methods of Pfeiffer, Wartha, and Lunge are considered unreliable. For temporary hardness the author titrates with tenth-normal acid and methyl orange. "Carbonate" and "mineral-acid" hardness are suggested as substitute terms for temporary and permanent hardness.

The determination of the clay content of soils, C. C. Fletcher (*Science, n. ser., 28* (*1908*), *No. 730, p. 930*).—In the method described the amount of clay is determined, after removing the coarser particles by centrifuging, by evaporating the clay water to dryness in enameled-ware cups having a capacity of about 300 cc. and weighing about 180 gm. The possibility of still further shortening the process by determining the percentage of clay by difference is suggested.

Shaking as a means of preparing soils for mechanical analysis, P. Kashinski (*Zhur. Opuitn. Agron.* [*Russ. Jour. Expt. Landw.*], *9* (*1908*), *No. 4, pp. 488–493*).—The effect of shaking as compared with boiling was studied in the mechanical analyses of three soils (one podzol, one alkali, and one chernozem). The results are summed up as follows: (1) Shaking gives less particles with the diameter less than 0.01 mm. and more particles of the diameter 0.25 to 0.05 than boiling does; (2) by increasing the volume of water in shaking these differences grew less; (3) for alkali and podzol soils the values obtained by shaking and boiling are practically equal. The values differ strikingly in the case of chernozem soils.

Methods of testing the efficiency of ventilation, Ellen H. Richards et al. (*Technol. Quart., 21 (1908), No. 3, pp. 321–331, figs. 3; abs. in Chem. Abs., 3 (1909), No. 1, p. 90*).—Simple methods and apparatus for the collection of samples of air in occupied rooms and for the determination of carbon dioxid are described.

From the observations recorded the conclusion is drawn that when in a crowded hall the temperature is less than 70° F., humidity less than 70 per cent, carbon dioxid less than 7 parts in 10,000, and there is no appreciable odor, the air is satisfactory. When the temperature rises to 80°, humidity to about 83 per cent, and carbon dioxid to 8 parts per 10,000, with a close odor, steps should be taken at once to improve ventilation.

Improvement in the technique of protein hydrolysis. The employment of hydrofluoric acid and its advantages, L. Hugounenq and A. Morel (*Bul. Soc. Chim. France, 4. ser., 3–4 (1908), No. 23, pp. 1146–1151*).—The authors conclude that hydrofluoric acid possesses many advantages for the hydrolysis of proteids in experimental studies of their cleavage products and structure.

The hydrolysis of fish muscle, T. B. Osborne and F. W. Heyl (*Amer. Jour. Physiol., 23 (1908), No. 2, pp. 81–89*).—Out of a total of 16.40 per cent nitrogen yielded by hydrolyzing halibut muscle, according to the method outlined, the different forms of nitrogen yielded the following portions: Nitrogen as ammonia 1.10 per cent, basic nitrogen 4.95 per cent, nonbasic nitrogen 9.96 per cent, and nitrogen in magnesium oxid precipitate 0.39 per cent.

"The nitrogen contained in the histidin, arginin, and lysin is equal to 4.16 per cent, or 0.79 per cent less than the basic nitrogen precipitated by phosphotungstic acid. This difference is nearly the same as that similarly found for chicken muscle, and is probably largely caused by basic substances of nonprotein origin contained in the muscle substance."

Concerning the constitution of phytin, C. Neuberg (*Biochem. Ztschr., 9 (1908), No. 5–6, pp. 557–560; 16 (1909), No. 4–5, pp. 406–410*).—According to the results of the author's investigations phytin is to be regarded as an inosit-phosphoric-acid ester.

Extending the use of the precipitin reaction, J. Fiehe (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 9, pp. 512–515, fig. 1*).—Filtering and handling the serum used in this reaction, and similar questions of laboratory technique, are discussed and some notes are given regarding the use of the method for identifying fat by means of the muscular tissue present in it.

Concerning the identification of starch, W. H. Bloemendal (*Pharm. Weekbl., 43 (1906), pp. 1249–1265; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, p. 691*).—The author endeavored to determine whether starches of different sorts showed differences in composition similar to those noted with cellulose, the general preference for arrowroot starch instead of potato starch as food, and the behavior of different starches to the iodin reaction and as regards paste formation indicating that such might be the case.

Determinations of the specific gravity, carbon hydrogen, and water content and heat of combustion of potato, rice, wheat, and maranta starches gave identical results, or results which differed only within the limits of error. Judging by the ease with which β-amylose (amylogranulose), for instance, is changed into α-amylose (amylocellulose) by simply drying, the author concludes that the difference between these substances is simply one of water content. He does not believe that α-amylose exists as such in the original starch grain.

The polarimetric determination of starch, C. J. Lintner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 14 (1907), No. 3, pp. 205–208; 16 (1908), No. 9, pp. 509–512*).—Data are given regarding a method devised by the author.

The alkalinity of meat ash and the ash of some casein preparations determined by Farnstein precipitation method, A. Kickton (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 10, pp. 561–574*).—A large number of determinations are reported and discussed.

The identification of horse meat by the biological method, R. Schüller (*Ztschr. Fleisch u. Milchhyg., 19 (1908), No. 2, pp. 41–48*).—A study of methods.

Examination of sausage, H. Kreis (*Chem. Ztg., 32 (1908), No. 86, pp. 1042–1045*).—A digest of data and a study of methods.

The identification of artificial and natural honeys and the detection of cane sugar and its decomposition products, I. Fiehe (*Chem. Ztg., 32 (1908), No. 86, pp. 1045, 1046*).—A contribution to the question of the resorcin-hydrochloric-acid method for judging honey.

The detection of formic acid in honey, T. Merl (*Ztschr. Untersuch. Nahr u. Genussmtl., 16 (1908), No. 7, pp. 385–389*).—A critical study of methods and progress report.

An important source of error in the estimation of caffein by the Juckenack-Hilger method, K. Lendrich and R. Murdfield (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, pp. 647–658*).—A critical study of methods.

The theobromin content of coco and a new method for estimating it quantitively, A. Kreutz (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 10, pp. 579–584*).—A progress report of methods for determining quantitatively the theobromin present in the free state and as a glucosid.

Judging alcohol-free wine, J. M. Krasser (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 7, pp. 398–400*).—The author considers that only those goods should be called alcohol-free wine which have been prepared by removing the alcohol of natural wine. The term, he believes, should not be applied to sterilized musts.

The use of Fiehe's resorcin-hydrochloric-acid reaction for identifying artificial invert sugar in wine, A. Kickton (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 10, pp. 574–579*).—A critical study of this method.

With what exactness can the analytical data of wine examinations be represented? (*Ber. K. Lehranst. Wein. Obst. u. Gartenbau Geisenheim, 1907, pp. 219–230*).—A summary and discussion of analytical data.

Participation of reductase in the process of alcohol fermentation, V. I. Palladin (*Izv. Imp. Akad. Nauk [Bul. Acad. Imp. Sci. St. Pétersb.], 6. ser., 1908, No. 8, pp. 667–672*).—This article gives the results of the author's experiments, which indicate that reductases participate in the process of alcohol fermentation. The reductases used were common zymin (yeast killed by acetone) and zymin poor in glycogen. When zymin was treated with an aqueous solution of sodium selenite and a few drops of toluene, metallic selenium was precipitated. A similarly treated portion when boiled showed no change. Other experiments showed that reductase participates in the process of decomposition of glucose into alcohol and carbon dioxid.

Color reactions as tests for heated milk, B. Herholz (*Beiträge zu bisher bekannten Reaktionen zur Unterscheidung von roher und erhitzter Milch mit besonderer Berücksichtigung der Guajakproben. Inaug. Diss., Univ. Braunsberg, 1908, pp. 102; Milchw. Zentbl., 4 (1908), No. 10, pp. 445–472; abs. in Chem. Zentbl., 1908, II, No. 18, p. 1540*).—The author made tests of a large number of methods used for detecting heated milk, and thinks that paraphenylendiamin, ursol, and guaiacol are trustworthy reagents for this purpose. The guaiac ring test is preferred, as it is simple and inexpensive and the reagent can be kept for some time without losing its characteristic properties. The intensity and duration of the blue zone that is formed is a test of the temperature to which the milk has been heated.

The differentiation of the enzyms in milk by hydrogen dioxid and its tests, C. H. Lawall (*Amer. Jour. Pharm., 81 (1909), No. 2, pp. 57–59*).—Milk which was suspected of having been preserved with hydrogen dioxid was tested by Dupouy's method and by the benzidin test of Wilkinson and Peters.

With both methods the preservative could be detected when present in varying amounts down to 0.5 of 1 per cent. The author considers these methods superior to the use of potassium chromate and diluted sulphuric acid. Small amounts could be detected only within a few hours after the hydrogen dioxid was added. The author also found that hydrogen dioxid inhibits or destroys the action of the enzym reacting with the Wilkinson-Peters test much more rapidly than it affects the enzym reacting with the Dupouy test, and that eventually it destroys the action of both of these enzyms and causes the milk to react the same as boiled or sterilized milk.

On the biological differentiation of milk, J. Bauer (*München. Med. Wchnschr., 55 (1908), No. 16, pp. 847, 848; abs. in Hyg. Rundschau, 19 (1909), No. 1, p. 33*).—The author used the "deviation of complement" process as a test for adulterated milk but found that it is unreliable, since unadulterated milk can retard hemolysis. The amount of water present can be approximately estimated, however, with a titrated serum.

On recent rapid methods for estimating the fat content of cream, Rusche (*Milchw. Zentbl., 4 (1908), No. 9, pp. 385–409*).—Methods of Gerber, Siegfeld, Sichler, and other investigators are reviewed and criticised.

The estimation of the fat content in cream, Grimmer (*Milchw. Zentbl., 4 (1908), No. 10, pp. 433–439*).—A discussion of the article noted above, relating chiefly to the correct formula when estimating fat with the Gerber butyrometer.

Butter and its adulterations under the microscope, W. Morres (*Österr. Molk. Ztg., 15 (1908), No. 23, pp. 312–314, figs. 12*).—The author believes that a microscopical examination of butter is an easy and reliable means for detecting butter adulterants.

On the estimation of sugar in bagasse, H. Pellet (*Internat. Sugar Jour., 10 (1908), No. 119, pp. 554, 555*).—A discussion of the determination of sugar with the Zameron apparatus. Correct results are not obtained unless precautions are taken to avoid the inversion of sugar. A single extraction always gives low results.

Explanation of the occasional abnormally high quotient of purity of some sugar-cane juices, H. Pellet (*Internat. Sugar Jour., 10 (1908), No. 119, pp. 558, 559*).—The author explains the abnormally high quotient of some sugar juices as follows: According to the quality of the cane and the manner in which it has been treated the juices obtained are in a more or less viscous condition, and consequently the air which has become entangled in the juice during the process of extraction is held by the liquid in a state of an emulsion and is incapable of escaping even after having stood for a comparatively long time. The Brix reading will, therefore, be more or less influenced by the presence of this emulsified air. It will, however, pass to its normal value when the air is expelled by heating or by other suitable means.

Determination of sugar in molasses cattle feeds and denatured sugar products, L. Vuaflart (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 5, pp. 339–341; Internat. Sugar Jour., 11 (1909), No. 121, pp. 38, 39; abs. in Jour. Soc. Chem. Indus., 27 (1908), No. 24, p. 1215*).—The author states that polarimetric methods are untrustworthy for determining sugar in these products, as there are optically active substances other than sucrose which are not precipitated by basic lead acetate. He recommends a method for determining sugar

in molasses feeds and one for denatured sugar mixtures containing linseed meal.

Application of the gasometric method to the exact determination of urea, A. Ronchèse (*Bul. Soc. Chim. France, 4. ser., 3–4 (1908), No. 23, pp. 1135–1141*).—Noted from another source (E. S. R., 20, p. 807).

Wood products, distillates and extracts, P. Dumesny and J. Noyer, trans. by D. Grant (*London, 1908, pp. XVI+320, figs. 107*).—A translation of a technical treatise on the industrial chemistry of wood and its preservatives. The special subjects treated are the carbonizing or "coaling" of wood, the manufacture of acetic acid and secondary products of wood distillation, analysis of raw materials and finished products, the destructive distillation of olive oil residuals, and the manufacture and testing of tan wood extracts and their utilization in modern tanneries.

Leather industries laboratory book, H. R. Procter (*London and New York, 1908, 2. ed., rev. and enl., pp. XX+460, pls. 3, figs. 46*).—This is the second edition of a work which "is occupied mainly with the practical details of analytical processes and makes no attempt to teach either chemical theories or the principles of leather manufacture." The chemical, microscopical, and bacteriological methods described have been tested in the laboratory and include processes used in the examination of tanning material. The work is intended as a supplement to the ordinary chemical text-book.

A new mercury azotometer, C. A. Garcia (*Bul. Soc. Chim. France, 4. ser., 3–4 (1908), No. 23, pp. 1111–1114, fig. 1; abs. in Analyst, 34 (1909), No. 395, p. 78, fig. 1; Jour. Chem. Soc. [London], 96 (1909), No. 555, II, p. 92*).—An apparatus in which the air space is reduced to a minimum with a view to thus increasing the accuracy of measurement is described.

A simple apparatus for the estimation of catalase, G. Koestler (*Milchw. Zentbl., 4 (1908), No. 12, pp. 532–535, figs. 3; abs. in Rev. Gén. Lait, 7 (1909), No. 9, p. 214*).—The apparatus described consists of a graduated tube provided with an agar cork, which is forced upward as gas is formed.

An apparatus adapted to a number of analytical purposes, M. E. Pozzi-Escot (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 4, pp. 267–271, fig. 1*).—The apparatus described is a small flask with accessory devices, which, as explained by the author, is adapted to use in a number of analytical determinations, including the determination of carbon dioxid in carbonates, amid, ammoniacal and nitrous nitrogen, oxygen in water, analysis of persulphates, perborates, percarbonates, and peroxids, hydrazin, and copper.

METEOROLOGY—WATER.

Wireless telegraphy in the service of modern meteorology, P. Polis (*Hansa, 45 (1908), No. 38, pp. 937, 938*).—This is a brief account of the use of wireless telegraphy to secure a series of weather observations on a trip on a large ocean liner from Hamburg to New York and return in August, 1908, and of the preparation of daily synoptic weather charts, with suggestions as to the aid a system of such observations would give in general weather predictions on sea and land.

Wireless telegraphy in the service of modern meteorology, E. Herrmann (*Hansa, 45 (1908), No. 39, pp. 962–964*).—The author questions whether weather reports from ships by means of wireless telegraphy, as suggested by Polis (see above), will prove of very great value in determining the laws controlling the distribution of variation in atmospheric pressure over wide areas, upon which accurate weather forecasting on land and sea depends.

Monthly Weather Review (*Mo. Weather Rev., 36 (1908), Nos. 11, pp. 357–394, figs. 2, charts 8; 12, pp. 395–434, figs. 3, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of November and December, 1908, recent papers bearing on meteorology and seismology, recent additions to the Weather Bureau library, notes from the Weather Bureau library, etc., these numbers contain the following articles and notes:

No. 11.—The Climate of the Historic Past (illus.), by E. Huntington; Notes on the Climate of Eastern Asia, by A. J. Henry; An Elementary Method of Deriving the Deflecting Force due to the Earth's Rotation for West-east Motion (illus.), by W. H. Jackson; Titles of Papers Read Before the German Meteorological Association; Relation Between the Range of Air Temperature and the Distribution of Land and Water, by M. Tsutsui; A Comparison of the Changes in the Temperature of the Waters of the North Atlantic and in the Strength of the Trade Winds, by W. C. Hepworth; Kassner's Meteorological Globes, by R. DeC. Ward; Luminous Fog; Brilliant Gulf Waters; New System of Storm Signals for Norway, by F. S. S. Johnson; Recent Progress in California; Suggested Reform in Meteorological Methods, by A. G. McAdie; and An Annotated Bibliography of Evaporation, by Mrs. G. J. Livingston.

No. 12.—Studies on the Vortices of the Atmosphere of the Earth (illus.), by F. H. Bigelow; Deficient Humidity Indoors, by F. H. Day; Wireless Telegraphy in the Service of Modern Meteorology, by P. Polis, trans. by C. F. Talman (see p. 1011); Remarkable Snowstorm at Grand Haven, Mich., by C. H. Eshleman; Tornadoes in Wisconsin, November 25, 1908; Severe Windstorms in Ohio, August 12 and 17, 1908, by J. W. Smith; Severe Windstorms in New Mexico and Oklahoma; A Luminous Meteor Cloud Observed at Urbana, Ill. (illus.), by C. J. Kullmer; The Training School at Tokyo, Japan, for Meteorological Observers; The Class under Instruction at Washington; Formation of Dew at Tree Tops; Hurricanes Affected by Mountain Ranges; Is the Earth Drying Up?; Tasmania and the Total Solar Eclipse; Driest Year at Portland, Me., by E. B. Jones; Address to the Mathematical and Physical Section of the British Association for the Advancement of Science, Dublin, September, 1908, by W. N. Shaw; The Baltimore Meeting of the American Association for the Advancement of Science, by W. R. Blair; The Baltimore Meeting of the Association of American Geographers; and Tornadoes in Arkansas during November, 1908 (illus.).

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and R. C. Lindblad (*Massachusetts Sta. Met. Buls. 241, 242, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1909. The data are briefly discussed in general notes on the weather of each month.

Meteorological report, 1907, F. H. Auld (*Ann. Rpt. Dept. Agr. Prov. Saskatchewan, 1907, pp. 92–106*).—This is a summary of observations on temperature and precipitation at 40 meteorological stations in Saskatchewan during the year 1907. The weather of each month is described.

Weather at Rothamsted in 1908, J. J. Willis (*Gard. Chron., 3. ser., 45 (1909), No. 1153, pp. 66, 67*).—Observations on temperature, precipitation, and general weather conditions are briefly summarized in this article. The year was characterized by a deficiency of rainfall, the total being 25.31 in., as against an average of 28.12 in. for the past 55 years. The mean temperature of the year, 48.2° F., was slightly, 0.3°, in excess of the average.

Danish meteorological conditions in 1907–8, V. Willaume-Jantzen (*Tidsskr. Landökonomi, 1908, No. 13, pp. 660–689*).—Conditions for each month from October, 1907, to September, 1908, inclusive, are summarized.

Meteorology (*New Zeal. Off. Yearbook 1908, pp. 618–623*).—Tabular summaries are given of observations on temperature, rainfall, atmospheric pressure, and wind at 14 stations in New Zealand during the year 1907.

Handbook of climatology, J. Hann (*Handbuch der Klimatologie. Stuttgart, 1908, 3. ed., rev. and enl., pp. XIV+394; rev. in Nature [London], 79 (1909), No. 2048, p. 363*).—This is the third revised and enlarged edition of this handbook. The most important revision is in connection with the sections on radiation, cyclical changes of climate, methods of computing averages for temperature and rainfall from incomplete or short series observations, and climatic zones of the globe.

Variations in climate, H. Arctowski (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 25, pp. 1438–1440; abs. in Rev. Sci. [Paris], 47 (1909), I, No. 1, p. 27; Sci. Abs., Sect. A—Phys., 12 (1909), No. 134, p. 72*).—On the basis of observations on temperature recorded during more than 50 years in different parts of the earth, but particularly from 1891 to 1900 in France, the author concludes that there are exceptionally warm or exceptionally cold years.

Temperature differences are not alike in size and magnitude at different places, but in many cases the variations at one place are the opposite of those at another. The amount of compensation between different stations is apparently insufficient to permit of the assumption of a constant mean temperature at the earth's surface. It is suggested that this is due to variations in intensity of solar radiation.

Public water supplies, F. E. Turneaure and H. L. Russell (*New York and London, 1908, 2. ed., rev. and enl., pp. XV+808, figs. 231*).—This is the second revised and enlarged edition of this standard work.

"The chapters relating to the purification of water have been thoroughly revised, that on mechanical or rapid filtration being rewritten and greatly enlarged. . . . Besides the matter relating to purification many other changes and additions have been made in nearly every chapter. The most important of these relate to methods of bacterial examination of water, the investigation of ground water and the construction of collecting works, data on the use of water, data on rainfall and flow of streams, the construction of dams, and the application of reenforced concrete to conduits, dams, filters, reservoirs, and tanks. The literature of each chapter has also been extended and brought up to date."

Chemical and biological survey of the waters of Illinois, E. Bartow et al. (*Univ. Ill. Bul., 6 (1908), No. 4, pp. 80, figs. 13*).—This report gives "a detailed description of the work accomplished during the 16 months ending December 31, 1907, with a summary, by years, of the analyses made since the foundation of the survey to that time, and a summary, by months, of the analyses made during the last two years. The new quarters into which the survey moved during the summer of 1907 are described.

"The progress of the cooperative work with the State board of health, and with the engineering experiment station of the University of Illinois, the State geological survey, and the Water Resources Branch of the United States Geological Survey, is reported.

"There are included the descriptions of several experiments or investigations carried on by the survey." Among these are Sanitary Chemical Examination of Water Bacteria, by A. W. Sellards; Stand for Fermentation Tubes, by W. G. Bain; Laboratory Experiments in Water Treatment, by E. Bartow and J. M. Lindgren; Normal Waters of Illinois; Investigation of Manufacturing Waste at Waukegan; and Character of the Underground Waters of Normal.

From the study of normal waters of Illinois, the conclusion is drawn "that waters from deep rock wells though varying in composition at different depths

and in different sections show an increase of mineral residue from north to south. This variation is shown at least from the northern border of the State to a line drawn from Quincy to Ottawa and probably to the southeast of the above line as indicated by isolated cases.

"The deep drift waters are so very variable that such tests as free ammonia and consumed oxygen have little value as means for judging their purity. Waters containing more sodium than is required to unite with the nitrate, chlorin, and sulphate ions predominate.

"The streams are all turbid and impure. The turbidity is more persistent to the south. All must be treated before being used for drinking purposes."

Bacteria in water, A. Koch (*Jahresber. Gärungs-Organismen, 16 (1905), pp. 154–171*).—The literature of this subject appearing during 1905 is reviewed.

Some features of the fifth report of the Royal Commission on Sewage Disposal, H. Lemmoin-Cannon (*Jour. Roy. Sanit. Inst., 30 (1909), No. 1, pp. 58–63*).—This is a brief summary of some of the chief features of this report, which has been previously noted (E. S. R., 20, p. 617), relating to sewage farming, processes in artificial systems, including preliminary treatment, chemical precipitation, septic tank treatment, and preparation and utilization of sludge, comparative cost of treatment by land and by artificial processes, and standards for sewage effluents. The conclusions of the report do not indicate any decided advantage of artificial treatment over land treatment either as regards efficiency or economy provided soil and other conditions are favorable to land treatment.

Purification and disposal of town and factory sewage, A. Reich (*Reinigung und Beseitigung städtlicher und gewerblicher Abwässer. Hanover, 1907, pp. 139, pl. 1, figs. 30*).—This is a concise summary of information regarding the nature of town and factory sewage, the collection and examination of water samples, the self-purification of streams, and methods of purification of sewage, including mechanical and mechanical-chemical methods, irrigation, biological processes, and electrical methods.

SOILS—FERTILIZERS.

The agricultural soils of Cape Colony, C. F. Juritz (*Agr. Jour. Cape Good Hope, 33 (1908), Nos. 1, pp. 33–45; 2, pp. 171–187, map 1; 3, pp. 318–335, figs. 2; 4, pp. 473–490; 5, pp. 599–613, figs. 3; 6, pp. 743–759, figs. 3; 34 (1909), Nos 1, pp. 64–90, figs. 3; 2, pp. 166–184, figs. 3; 3, pp. 277–294, figs. 2*).—This article discusses the value of chemical analysis as a means of determining the fertility of soils, describes methods commonly employed for such analysis, especially those used by the author in the examination of Cape Colony soils, presents an argument in favor of systematic soil surveys and investigation in the colony, and reports results of analyses of about 800 samples of soil from different parts of the colony, of which 442 were collected in pursuance of a systematic soil survey and represented 27,000 square miles, or one-tenth of the total area.

Most of the soils were analyzed by the standard method based on extraction with hydrochloric acid of 1.115 sp. gr. A considerable number, however, were examined by the German official method and a few by the Maercker, Hilgard, and Dyer methods for comparative purposes.

The humus deposits in the limestone Alps, Wilhelm Graf zu Leiningen (*Naturw. Ztschr. Forst u. Landw., 6 (1908), No. 11, pp. 529–538, pls. 2; 7 (1909), Nos. 1, pp. 8–32; 3, pp. 160–173; 5, pp. 249–273*).—This article discusses Alpine peat deposits in general; the terminology of forms of humus; peat formation in wet and dry places; relation of animal life, lower organisms and wind-borne matter, character of plants, character of decomposition, and pres-

ence or absence of lime to the nature of the humus; nature of subsoils underlying peat deposits; plant food and free acids in peat; and classification of types of soil, vegetation, and humus in peat deposits.

Contribution to the study of the humus matter of peat, L. Roger and E. Vulquin (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 25, pp. 1404–1406*).—Studies of the humus matter obtained by extracting fibrous peat with 10 per cent soda solution are reported which indicate that the process of peat formation results in the accumulation of nitrogen and carbon in the products of decomposition of vegetable matter. Neither pentosans nor hexosans were found in the peat. A new fact observed was that the humus of peat has decidedly acid properties.

Recent results of investigations in soil bacteriology and their value for agricultural practice, J. Simon (*Neuere Ergebnisse bodenbakteriologischer Forschungen, ihr Wert für die landwirtschaftliche Praxis. Dippoldiswalde, [1908], pp. 27, dgms. 2*).—The author discusses the bearing of recent bacteriological investigations on the nitrogen cycle in the soil, soil inoculation, and the accumulation of nitrogen in the soil, and the best practical means of increasing the activity of beneficial soil organisms.

Legume bacteria, S. F. Edwards and B. Barlow (*Ontario Dept. Agr. Bul. 169, pp. 32, figs. 45*).—Studies on nitrogen assimilation by legumes which have been going on about 5 years are summarized. Previous accounts of this work have been noted (E. S. R., 19, p. 528). The results of practical tests of inoculating material prepared and distributed by the authors are also summarized. See also a previous note (E. S. R., 19, p. 1121). During 1908 "2,113 cultures were distributed, and reports were returned from 634, or 31.7 per cent. Of these, positive beneficial results were stated in 397, or 62.6 per cent, and no benefit was apparent in 237, or 37.4 per cent."

Investigations on the process of denitrification, M. Cingolani (*Staz. Sper. Agr. Ital., 41 (1908), No. 8, pp. 530–540; Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 2 (1907–8), pp. 274–284; abs. in Chem. Ztg., 32 (1908), No. 77, pp. 922, 923; Chem. Zentbl., 1908, II, No. 19, pp. 1626, 1627; Jour. Chem. Soc. [London], 96 (1909), No. 556, II, p. 171*).—The author reports investigations in which he isolated from fresh calf manure 2 new denitrifying organisms which he has named *Bacterium porticensis denitrificans α* and *B. porticensis denitrificans β*. The morphological and cultural characters of these organisms are fully described. When cultures were kept at a temperature of 97° F., intense fermentation developed in from 12 to 48 hours and in 2 to 6 days the nitric acid (0.3 per cent) had entirely disappeared.

The action of heat and antiseptics on soils, S. U. Pickering (*Jour. Agr. Sci., 3 (1908), No. 1, pp. 32–54; abs. in Jour. Soc. Chem. Indus., 28 (1909), No. 4, p. 212*).—In continuation of previous work on the effect of moist heat on the soluble constituents of soil (E. S. R., 20, p. 737), the author compared the effect of moist heat and various volatile antiseptics on the productiveness of soils.

The experiments were made with kilogram samples not only of the Rothamsted soil used in previous experiments, but also with various other kinds of soils, including a sample of unproductive soil from Takoma Park, D. C. The effect of the different treatments on solubility of the soil constituents and on the germination of seeds of wheat, rye, clover, mustard, rye grass, and fescue was determined. The results are summarized as follows:

"When soils are treated with antiseptics, such as carbon disulphid, chloroform, benzene, ether, or paraffin oil, they undergo chemical change, and the soluble organic matter in them is increased, just as in case of their being heated; they also exhibit the same inhibitory effect on the germination of seeds that heated soils do.

"The different antiseptics differ in the intensity of their action, but the inhibitory substance formed is probably the same in all cases, and also the same as that formed by heat, for the quantity formed has the same effect on seeds, whether produced by antiseptics or by heat.

"On keeping treated soils for a few weeks at a summer temperature, some of the organic matter which was rendered soluble becomes insoluble, and the inhibitory action is reduced. This is also the case with heated soils, especially when repeatedly watered; though with unheated soils under similar conditions the soluble matter increases.

"The treatment of soils with antiseptics induces a change equivalent to that obtained by heating the soil to 60° to 75°, and this may be sufficient to account for the increased growth observed in plants grown in them.

"The production by heat of a substance inhibitory to germination appears to be a property common to all soils, twelve instances having been examined. The proportion of it formed depends on the increase in the amount of organic matter rendered soluble by heating; but the actual amount of the soluble organic matter in the heated soil is not always a criterion as to the intensity of its inhibitory action, and still less is the amount of soluble organic matter originally present in the unheated soil, though in the majority of cases it may be so. There appears to be no connection between the fertility of a soil and the extent to which it is altered by heating.

"Soils in their natural state appear generally to contain a certain amount of this inhibitory substance, as they act less favorably towards germination than pure water does. Whether in any cases soils can act more favorably than water—as the earlier experiments had indicated they could—is open to doubt, but the probability is in favor of their doing so. So far as the instances now examined are concerned, the richer soils, and those containing most soluble organic matter, as slightly less favorable to germination than the poorer soils."

The rôle of oxidation in soil fertility, O. Schreiner and H. S. Reed (*U. S. Dept. Agr., Bur. Soils Bul. 56, pp. 52*).—A series of experiments is reported in which the oxidizing power of roots of wheat seedlings grown in water extracts of soils of different kinds was studied by means of soluble chromogens such as alpha-naphthylamin, benzidin, vanillin, vanillic acid, and esculin, which yield upon oxidation by the plant roots insoluble colored compounds which are to a large extent deposited upon the surface of the roots, and chromogens such as phenolphthalein, aloin, and leucorosolic acid, which are converted into soluble coloring matters in the solutions.

The authors conclude from the results obtained in these experiments that wheat roots have an extracellular oxidizing power due chiefly to the enzyms which they secrete, and that oxidation is most active in the newer regions of the roots. It was found to be more pronounced in plants grown in extracts of productive soils than in those grown in extracts of unproductive soils.

"Treating the soil extracts with an absorbing agent is usually beneficial to oxidation.

"The distillate of a poor soil extract which contains volatile toxic compounds was less favorable to oxidation than the residue remaining from distillation.

"The process of oxidation is usually accelerated by the addition of nitrates to an aqueous soil extract. The addition of ammonium sulphate is less beneficial to oxidation than the addition of an equal amount of nitrogen in the form of nitrate.

"Calcium salts were found to increase the amount of oxidation in cultures to which they were added.

"The addition of potassium salts was not generally beneficial to the processes of oxidation. In some cases their presence caused a material retardation

of the oxidation. The most of the retardation was due to the action of the potassium itself and not to the formation of acid conditions in the solution. Sodium or ammonium salts of the same acid were more favorable to oxidation than the corresponding potassium salt.

"Phosphates usually produced material increases in the oxidation in solutions to which they were added.

"Chlorids and sulphates, when combined with a suitable base, like sodium, are somewhat beneficial to oxidation, but are not as favorable as the corresponding nitrate would be.

"The presence of toxic organic substances in solution was extremely deleterious to the oxidizing power of plants. The oxidizing power of the plants, especially in the presence of nitrates, was able to alleviate the toxicity of such solutions.

"The process of oxidation by roots is largely, if not entirely, due to the activity of a peroxidase produced by the roots. This oxidizing enzym is most active in neutral or slightly alkaline solutions. The activity of the enzym may be inhibited by the presence of acid and also by the conditions in solutions where putrefaction processes occur."

Soil improvement work, S. D. Conner (*Indiana Sta. Rpt. 1908, pp. 39–42*).—A brief statement is made regarding the cooperative soil improvement experiments which have been conducted in 45 different localities in 33 counties of the State, and a fuller account is given of two such experiments on peat soil in Newton and Henry counties and one on a clay soil in Scott County. The peat soils have been found to be greatly benefited by applications of potash, while in the clay and loam soils phosphorus appears to be the element most needed. These soils are also much benefited by ground limestone and slaked lime.

Soil fertility, T. F. Hunt (*Pennsylvania Sta. Bul. 90, pp. 26, charts 7*).—This is a summary of the results of a series of fertilizer experiments on a clay loam soil of limestone origin which have been carried on for 25 years at this station.

The more important facts brought out by the results are that phosphoric acid is the only fertilizing constituent which produced an increase in yield when used alone. A larger increase, however, was obtained when both phosphoric acid and potash were used. The productive power of the soil was maintained during the 25 years by applying in alternate years 48 lbs. of phosphoric acid and 100 lbs. of potash per acre in a rotation in which clover occurred once in 4 years, but a material increase in yield resulted from the addition of 24 lbs. of nitrogen per acre to the mineral fertilizers. Nitrate of soda gave better results as a source of nitrogen than either dried blood or sulphate of ammonia. An acid condition, proving especially injurious in later years to corn and clover, resulted from the continued application of sulphate of ammonia.

The crop producing power of the soil was maintained during the 25 years without the use of any yard manure. "Without the addition of any organic matter to the soil, except the roots and stubble of the crops raised, the fertility has been fully maintained. In other words, a complete commercial fertilizer and yard manure having maintained the crop producing power equally well in a 4 years' rotation containing clover. Comparatively small quantities of yard manure applied on alternate years, viz, to the corn and wheat, have produced marked increase in yield compared with plats receiving no fertilizer. . . . The addition of 4,000 lbs. of quick lime applied once in 4 years to plats receiving no fertilizer has caused the decrease in yield, but when applied in connection with 6 tons of yard manure the products produced were equal to those produced by an application of 10 tons of manure without lime."

The general conclusion arrived at is that economic farm management under the conditions obtaining in these experiments requires the use of yard manure

supplemented by commercial fertilizers, and "that the best results can be obtained only by a continuous and systematic use of fertilizers in connection with a well ordered method of cropping."

Theories of manure and fertilizer action, A. D. Hall (*Science, n. ser., 28 (1908), No. 723, pp. 617–628, fig. 1; Amer. Fert., 30 (1909), No. 3, pp. 23–30*).—This is a lecture given at the Graduate School of Agriculture at Cornell University in July, 1908, and discusses at some length the various theories which have been advanced to explain the action of manures and fertilizers, the discussion being based mainly upon Liebig's generalizations and conclusions from the results of experiments at Rothamsted and of investigations of the Bureau of Soils of this Department.

The author concludes that there is no direct proof of the supposition "that all soils give rise to soil solutions sufficiently rich in the elements of plant food to nourish a full crop did not some other factor come into play," nor convincing evidence "of the excretion of toxic substances from plants past the autotrophic seedling stage. . . .

"If, however, we give the theory a wider form, and, instead of excretions from the plant, understand débris of any kind left behind by the plant and the results of the bacterial action upon it, we may thereby obtain a clue to certain phenomena at present imperfectly understood. . . .

"Assuming that the persistence in the soil of obscure diseases appropriate to the particular plant can be neglected as the cause of these phenomena, there still remains some unexplained factor arising from a plant's growth which is injurious to a succeeding crop, and this may either be the excreted toxins of Whitney's theory or may be some secondary effects due to the competition of injurious products of the bacteria and other microflora accumulating in the particular soil layer in which the roots of the crop chiefly reside."

[Miscellaneous fertilizer notes] (*Sugar Beet, 30 (1909), No. 1, pp. 18–21*).—Brief notes are given on European investigations on the acclimatization of nitrifying organisms, the use of manganese as a fertilizer, the physiological function of potash in plants, the importance of soda in the growth of sugar beets, Thomas slag as a fertilizer for sugar beets, and toxic substances in soils. The investigations on which these notes are based have already been noted.

Experiments with chemical fertilizers in 1908, E. Chuard and C. Dusserre (*Bul. Soc. Vaud. Agr. et Vit., 1909, No. 225, pp. 303–308*).—Cooperative experiments with 10 farmers in 5 different localities in the Canton of Vaud to determine the profitableness of applying superphosphate, nitrate of soda, and potash salts on well manured soils of good productive capacity are reported. The results show that the chemical fertilizers gave profitable returns on wheat, oats, and maslin (mixed grain).

Cooperative fertilized experiments in Sweden, 1907, P. Bolin (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 4, pp. 177–265, dgms. 5*).—The experiments, similar in plan to those of previous years, were conducted with spring grains, root crops, meadows, and lupines. Comparative trials with nitrate of soda and calcium cyanamid, and variety tests were also conducted.

Results obtained with different forms of nitrogen, Clausen (*Landw. Wchnbl. Schles. Holst., 59 (1909), No. 4, pp. 47–50*).—Comparative tests of nitrate of soda, lime nitrogen, Norwegian nitrate, and ammonium salts with rye, barley, oats, and potatoes are reported.

The Norwegian nitrate was fully as effective as the better known nitrate of soda and sulphate of ammonia. The lime nitrogen was especially effective on potatoes and rye, but less so on summer grain. The high absorptive power of the Norwegian nitrate for moisture and the very finely powdered condition of the lime nitrogen interfere somewhat with their handling.

Recent investigations of the nitrogenous fertilizers, C. Schreiber (*Rev. Gén. Agron., n. ser., 3 (1908), Nos. 11, pp. 433–440; figs. 2; 12, pp. 481–486; 4 (1909), No. 1, pp. 4–9, fig. 1*).—Pot experiments with oats are reported which had for their object the study of the loss of nitrate of soda from sandy soils in the drainage. Previous experiments had shown that there was very little loss of nitrate of soda from loam soil in good condition thoroughly cultivated, even when the nitrate was applied two or three weeks before planting. The losses were but little larger in the sandy soil notwithstanding abundant rainfall during the season.

Pot experiments with lime nitrate and lime nitrogen (calcium cyanamid) on oats on clayey and sandy soils showed that the first was about equal to nitrate of soda as a fertilizer, but that the second was decidedly less efficient (53 to 73 per cent). Lime nitrogen applied as a top-dressing at the time of seeding retarded germination and prevented growth of plants. When incorporated with the soil the day of seeding it produced less increase of yield than when cultivated in 15 days before seeding. The use of lime (carbonate) with the lime nitrogen produced an injurious effect. See also a previous note (E. S. R., 20, p. 428).

In pot experiments with oats to determine the effect of calcium carbonate on ammonium sulphate used as a fertilizer it was found that decided losses of ammonia occurred when ammonium sulphate was applied as a top-dressing on soils rich in lime.

On the loss of nitrogen in drainage waters, J. Graftiau (*Ann. Gembloux, 19 (1909), No. 2, pp. 69–75*).—This article points out that the conclusions recently reported by Schreiber (see above) were drawn from experiments in which very large crops were grown and the drainage was very small. It is believed that the conclusions are not applicable to normal conditions of field culture.

Loss of nitrogen by leaching of nitrate of soda, C. Schreiber (*Ann. Gembloux, 19 (1909), No. 3, pp. 160–165*).—This is a reply to Graftiau's criticism of the author's experiments noted above, presenting further data from field experiments in support of the author's conclusions.

Further note on the loss of nitrogen in drainage waters, J. Graftiau (*Ann. Gembloux, 19 (1909), No. 4, pp. 214–222*).—This is a further contribution to the discussion of the above report on this subject by C. Schreiber. The author insists that neither Schreiber's experiments nor those of other investigators cited by him justify practical generalizations.

The loss of nitrogen by seepage of nitrate of soda, C. Schreiber (*Ann. Gembloux, 19 (1909), No. 5, pp. 327–332*).—This is a further reply to Graftiau's criticism of the author's conclusions regarding this subject.

Action of sulphate of ammonia containing 3 per cent of sulphuric acid on the growth of plants, O. Lemmermann and A. Einecke (*Fühling's Landw. Ztg., 57 (1908), No. 23, pp. 787–791*).—In continuation of previous experiments (E. S. R., 20, p. 429), the effect of the sulphate of ammonia alone and combined with acid phosphate was tested in pot experiments with barley, with the result that nearly as good yields were obtained with the sulphate containing 3 per cent acid, even with the addition of acid phosphate, as with the acid-free sulphate.

The agricultural use of calcium cyanamid, A. Müntz and P. Nottin (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 20, pp. 902–906; Bul. Soc. Agr. France, 1908, Dec. 15, pp. 375–379; Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 50, pp. 718–721; Jour. Agr. Prat., n. ser., 16 (1908), No. 49, pp. 718–720; Jour. Chem. Soc. [London], 96 (1909), No. 555, II, p. 88; Chem. Abs., 3 (1909), No. 4, p. 468*).—Comparative tests of the rate of nitrification of calcium cyanamid,

ammonium sulphate, blood, and roasted leather are reported, showing that taking the rate of nitrification of sulphate of ammonia during 5 months as 100, that of calcium cyanamid was 88, dried blood 66, and roasted leather 26. When as in these experiments the cyanamid was employed in amounts 10 to 20 times greater than those ordinarily used in practice, the nitrifying organisms were paralyzed at first and even a small amount of denitrification occurred, but in a short time the organisms apparently adapted themselves to the medium and normal nitrification was restored. This retardation is due to the cyanamid and not to the excess of caustic lime present. Amounts of the material furnishing 35.7 lbs. of nitrogen per acre may be applied without any retardation of nitrification. Very large amounts may be applied to humus soils in a very active state of nitrification without retarding this process, and still larger amounts may be used (60 times that employed in intensive culture) if added in successive applications extending over a considerable period (4 months).

Comparative field tests on different kinds of soil confirm in general the laboratory results. In only one case were unfavorable results obtained in the application of the cyanamid at the time of planting. Nevertheless, as a precautionary measure it is advised to apply the material shortly in advance of planting. The cyanamid was applied in amounts furnishing 35.7 lbs. of nitrogen per acre in March and April on wheat and oats, and in amounts furnishing 41.95 lbs. of nitrogen per acre on grapes and natural grass lands. In damp weather there was no injury from such application. In dry weather the grain and grass were slightly burned, but soon recovered from the bad effects and the final yield was not reduced. The authors advise, however, that the cyanamid should not be applied as a top-dressing except in wet weather.

The general conclusion from these investigations is that calcium cyanamid is substantially analogous to sulphate of ammonia as a fertilizer.

On the decomposition of lime nitrogen in soils, H. Immendorff (*Chem. Ztg., 32 (1908), No. 80, pp. 971, 972; Umschau, 12 (1908), No. 44, pp. 874–876; Österr. Chem. Ztg., 11 (1908), No. 23, pp. 315, 316*).—Investigations on this subject are reviewed.

Physiological action of dicyandiamid, O. Loew (*Chem. Ztg., 32 (1908), No. 57, pp. 676, 677; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 551, II, p. 775; Chem. Abs., 3 (1909), No. 2, p. 221*).—Observations are reported which led to the conclusion that dicyandiamid is not a good source of nitrogen for many kinds of soil bacteria, the growth being much less rapid in media containing small amounts of this substance than in those containing ammonium sulphate.

When young barley plants were placed in a 5 per cent solution of the substance an injurious effect was noticed after 2 days. Lathyrus plants withstood the injurious action of dicyandiamid somewhat longer. With 0.05 to 0.1 per cent solutions only the points of the leaves were affected. Twigs of Tradescantia in 0.1 per cent solution and Elodea in 0.2 per cent solution showed no injurious effects, and Elodea apparently utilized the dicyandiamid as a source of nitrogen. Threads of Spirogyra remained intact for several days in 1 per cent solutions of dicyandiamid, and worms lived for more than 4 days in 0.5 per cent solution. Bacteria were not injured in the least in broth containing 0.5 per cent of the substance.

The structural formula of the dicyandiamid is discussed.

The importance of nitrogen, H. Steinmetz (*Ber. Naturw. Ver. Regensburg, 1905–6, No. 11, pp. 108–119*).—The importance of nitrogen in relation to industry and plant and animal life, and the possibilities of developing the manufacture of

nitrogen compounds from the free nitrogen of the air are discussed. The dependence of the manufacture of such compounds upon cheap sources of power is explained as well as the sources of water power for this purpose in Germany.

The nitrogen question and its solution, N. Caro (*Österr. Chem. Ztg., 12 (1909), No. 1, pp. 3–5*).—This article reviews briefly various methods which have been proposed in recent years for increasing the supply of combined nitrogen, such as the preparation of ammonium sulphate by the dry distillation of coal, the Mond gas process, the utilization of peat, and the manufacture of calcium cyanamid.

Sulphate of ammonia in 1908, Maizières (*Engrais, 24 (1909), No. 5, pp. 124–127; abs. in Mark Lane Express, 100 (1909), No. 4035, p. 89*).—Statistics of production and consumption of ammonium sulphate are given.

The synthesis of ammonia by means of peat, H. Woltereck (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 25, pp. 1402, 1403; abs. in Jour. Chem. Soc. [London], 96 (1909), No. 556, II, p. 138*).—Further tests of Woltereck's process, which has been previously noted (E. S. R., 19, p. 1124), showed that the products obtained contained much more nitrogen than would be yielded by the amount of peat employed.

The oxidation of the nitrogen of the air, O. Schönherr (*Ztschr. Angew. Chem., 21 (1908), No. 31, pp. 1633–1637; trans. in Jour. Indus. and Engin. Chem., 1 (1909), No. 2, pp. 120, 121; abs. in Amer. Chem. Jour., 41 (1909), No. 1 pp. 75, 76*).—This article deals especially with a method employed by a Baden firm for the manufacture of nitrate, but discusses incidentally other processes proposed for this purpose. The method especially referred to is an electrical process similar to that of Birkeland and Eyde, the essential difference being that the air is carried along a quietly burning arc of great length instead of being forced through the electric flame.

A future substitute for nitrate of soda, K. Birkeland and A. Frank (*8. Internat. Landw. Kong. Wien, 1 (1907), pp. 230–234; 2 (1907), Sect. IIB, Ref. 1, pp. 27+7*).—This is a discussion of the present status and future possibilities of the manufacture of basic lime nitrate by the Birkeland and Eyde process and of calcium cyanamid by the Frank and Caro process.

Calcium cyanamid (*Mark Lane Express, 100 (1909), No. 4034, pp. 59, 61, figs. 3*).—This article discusses the characteristic qualities, storage and mixing, sources, price, use, and methods of application of lime nitrogen.

Calcium cyanamid (*Engin. and Min. Jour., 87 (1909), No. 2, p. 138*).—This is a brief note on the progress in the establishment of factories for the manufacture of this product, attention being called particularly to the plant in course of construction at Niagara Falls, Ontario. It is expected that this plant will begin operation early in the spring of 1909. The calcium cyanamid to be produced will contain about 10 per cent of nitrogen and no free lime.

New Canadian industry, W. H. H. Webster (*Mo. Cons. and Trade Rpts. [U. S.], 1908, No. 338, p. 125*).—This is a brief account of the calcium cyanamid factory which is being built at Niagara Falls, Ontario.

Potash silicate, P. Krische (*Illus. Landw. Ztg., 28 (1908), No. 79, pp. 685, 686; abs. in Chem. Abs., 3 (1909), No. 1, p. 94*).—This article reviews briefly several unsuccessful attempts to use ground rock as a fertilizer, and calls attention to a proprietary potash silicate (a fine-ground eruptive rock, phonolith) which is now being put on the German market. The objections to the use of silicate of potash as fertilizer are stated to be low percentage of soluble potash, high cost as compared with soluble potash salts, and lack of water-holding power.

Potash silicate (ground phonolith) as a potash fertilizer, P. Wagner (*Deut. Landw. Presse, 36 (1909), No. 1, pp. 1–3; abs. in Landw. Ztschr. Rheinprovinz, 10 (1909), No. 7, p. 85*).—Comparative tests of sulphate of potash and of a fine-ground eruptive rock known as phonolith, containing about 50 per cent of silica, 9 to 10 per cent of potash, and 8 per cent of soda, on Italian rye grass, tomatoes, and mustard, are reported.

The results show that the potash of the ground phonolith is very resistant to the solvent action of acids and of soils and roots. The potash is so firmly combined with silicic acid that scarcely one-half of it is dissolved by 10 per cent hydrochloric acid and very little by the roots of plants.

Soil fertility and phosphoric acid, G. S. Fraps (*Trans. Texas Acad. Sci., 10 (1907), pp. 40–44; Amer. Fert., 30 (1909), No. 2, pp. 5–7*).—This article is based largely upon results of experiments reported in a bulletin of the Texas Station (E. S. R., 19, p. 919), which have shown that the soils of Texas are especially in need of phosphoric acid; that soils may contain phosphates which are equally soluble, but are assimilated with unequal readiness by plants; that two soils may contain equal quantities of phosphoric acid of equal value to plants and yet on account of variation in absorbing powers of the soil the amounts of phosphoric acid dissolved from the two soils may be widely different; and that the same compounds of phosphoric acid may have different values for the same plant in different soils. The author is of the opinion that soils deficient in phosphoric acid are widely distributed in the South.

Shall we use natural rock phosphate or manufactured acid phosphate for the permanent improvement of Illinois soils? C. G. Hopkins (*Illinois Sta. Circ. 127, pp. 23*).—This is a reply to a pamphlet issued by a large packing house opposing the use of untreated rock phosphate. The results of experiments by a number of stations are quoted to show that under certain conditions such phosphate may be profitably used.

Phosphoric acid of varying solubility in citric acid as a fertilizer for meadows, H. Svoboda (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 10, pp. 733–774; abs. in Chem. Ztg., 32 (1908), No. 103, Repert., p. 674; Chem. Centbl., 1908, II, No. 24, p. 1893; Jour. Chem. Soc. [London], 96 (1909), No. 556, II, p. 177*).—Comparative tests, extending over a series of years, with Thomas slag of varying solubility in citric acid, bone meal, and rock phosphate are reported. The results show in general that while phosphates having a high degree of solubility in citric acid act more quickly, they are more rapidly exhausted and on this account are not so well suited to the fertilizing of meadows as less soluble phosphates.

Modern land-pebble phosphate-mining plants in Florida, H. D. Mendenhall (*Engin. News, 60 (1908), No. 16, pp. 410–414, figs. 7*).—This is an account of a modern phosphate-mining plant, of which there are about 20 in the land pebble district of Florida, each turning out from 50,000 to 500,000 tons of phosphate a year.

Phosphate industry in Tennessee, H. D. Ruhm (*Engin. and Min. Jour., 87 (1909), No. 2, pp. 139, 140*).—The situation in the Tennessee phosphate field during 1908 is briefly reviewed.

Agricultural lime, E. H. Jenkins and E. M. East (*Connecticut State Sta. Bul. 163, pp. 3–18*).—This bulletin discusses, on the basis of examinations of samples collected in Connecticut, the sources, composition, and prices of agricultural lime in that State, as well as its action in the soil.

Lime, J. P. Rowe (*Univ. Mont. Bul. 50, pp. 40–42, pls. 6*).—The limestone deposits of Montana and their utilization in the preparation of lime are briefly discussed.

Gypsum deposits, J. P. Rowe (*Univ. Mont. Bul. 50, pp. 31–39, pls. 3, figs. 3*).—Economic deposits of gypsum in what are termed the north, middle, and south fields of Montana are briefly described.

Lime and marl examinations in Jutland, 1908, M. K. Kristensen (*Tidsskr. Landbr. Plantcarl, 15 (1908), No. 5, pp. 621–644*).—Analyses of a large number of samples of lime and marl are given, and the results discussed.

Magnesia, its function and use in agriculture, F. Rigaux (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 6, pp. 444–448*).—From analyses of a number of Belgian soils the conclusion is drawn that many soils naturally contain so little magnesia or are so reduced in this constituent by the methods of cropping pursued that they are unable on this account to produce maximum yields. Analyses are given which indicate that magnesia is an important constituent of crops. It is shown from experiments by Pellet on various Belgian soils that as a rule the yield and quality of cereals, potatoes, sugar beets, and leguminous plants were improved by application of magnesia, and by Lawes and Gilbert, Stutzer, and others that the fertilizing value of ammonia salts is increased by the use of magnesia in connection with them.

Manurial value of sewage and sewage sludge (*Jour. Bd. Agr. [London], 15 (1908), No. 9, pp. 690–696*).—This is a brief discussion based mainly upon the fifth report of the Royal Commission on Sewage Disposal (E. S. R., 20, p. 617).

Attention is called to the loss of nitrogen in ordinary methods of sewage disposal and the method of preparing sewage sludge is described. The sludge is mixed with 0.5 to 1 per cent of lime in the form of milk-of-lime and pressed by means of compressed air into cakes containing from 50 to 65 per cent of water and from 0.89 to 1.28 per cent of nitrogen. The cost of the process is estimated at from 50 cts. to $1.25 per ton of pressed cake. The calculated fertilizing value of the material is stated to be from $1.50 to $1.75 per ton, "but the actual market value is insignificant, owing to the relatively high cost of carriage upon a mixture containing of necessity a large proportion of water, grit, and carbonaceous matter."

Tests of the fertilizing value of the sludge on mangel-wurzels, beets, swedes, wheat, and grass at Woburn and at several agricultural colleges in England indicate "that unit for unit the nitrogen and the phosphoric acid of sludge seem to be of less value manurially than the nitrogen and phosphoric acid of artificial manures; at any rate so far as the first year of application is concerned. It also appears that sewage sludge is not a suitable dressing for quickly growing plants, unless it is applied in very large quantities per acre."

Analyses of the ashes discharged during the eruption of Vesuvius in April, 1906, D. Girasoli (*Atti R. Ist. Incoragg. Napoli, 6. ser., 59 (1907), pp. 239–243*).—The rain of ashes lasted from April 4 to 21. During the first days the ashes had the appearance of coarse black sand, the next were much finer and gray in color, and at the last there was an almost impalpable dust of a reddish color. A physical separation by means of electrical currents of different strengths showed an abundance of magnetite with fragments of lava, vitreous substance, augite, leucite, feldspar, and olivin, with some scales of mica. Chemical analyses of the different separates are given.

Consumption of fertilizers (*Amer. Fert., 30 (1909), No. 1, p. 6*).—A table is given showing the consumption of commercial fertilizers in various States during 1907. The total is given as 4,451,523 tons.

Fertilizers in South Australia, W. L. Summers (*Jour. Dept. Agr. So. Aust., 11 (1908), No. 12, pp. 1113–1115, fig. 1*).—Statistics of the use of fertilizers since 1897 are given.

AGRICULTURAL BOTANY.

A statistical criterion for species and genera among the bacteria, C. E. A. WINSLOW (*Bul. Torrey Bot. Club, 36 (1909), No. 1, pp. 31–39*).—Attention is called to the almost infinite number of variations in different groups of bacteria and the difficulty of their classification. The author has attempted their classification by the statistical method and has devoted several years to work on the classification of the family Coccaceæ (see p. 1079). He has found that others are pursuing the same method for limiting the species of other groups of bacteria, and he concludes that in groups like bacteria and perhaps in some classes of fungi, which have differentiated along physiological rather than morphological lines, differences in metabolism may have the same systematic importance that is given to gross structural differences in other groups.

The characters vary in each particular group and their value for classification must be determined by a survey of their relationships. The most satisfactory method of studying the systematic relations of these simple and variable forms is by obtaining quantitative measurements of a number of characteristic properties in a large series of individuals and by statistical analysis of the results.

The author believes that generic names may be given to the larger groups of organisms which have several apparently independent properties in common, and specific names may be reserved for the smaller groups, characterized by variations in single uncorrelated properties.

Studies on bacterial enzyms, II. ZIKES (*Wchnschr. Brau., 25 (1908), No. 24, pp. 361–366*).—A summary is given of information regarding the occurrence and function of bacterial enzyms.

The proteases of plants, VI, S. H VINES (*Ann. Bot. [London], 23 (1909), No. 89, pp. 1–18*).—This is the sixth contribution of the author's on this subject, those previous having been noted (E. S. R., 19, p. 931). From his studies the author is led to reject the hypothesis of the occurrence of trypsin in plants, and he proposes in its stead the theory that the proteases of plants belong to two groups, the peptases and the ereptases, and claims that this view is supported by considerable direct and indirect evidence.

The ereptases are enzyms which are readily soluble in water and in alcohol up to about 65 per cent. Their digestive activity seems to be exclusively peptolytic and to be especially associated with acid media. Thus far the author has been unable to give an approximate reaction range for plant ereptase.

The peptases are proteases the digestive activity of which is limited to the peptonization of the more complex proteins. There appears to be some ground for believing that there are two kinds of peptases, which differ from each other in the mode of their occurrence and in the relation between their respective digestive activities and the reaction of the medium. The first kind exists in the tissues of plants, fruits, seeds, latex, etc., and to this is given the name endopeptase. The other kind is found in the excretions of plants, as in the pitcher liquid of Nepenthes, and is designated as ectopeptase.

The author concludes the series of papers by calling attention to the analogies between proteolytic enzyms of plants and those of animals. The enzym which he has called ectopeptase agrees in all essential properties with animal pepsin. It is not so easy to find an animal analogue for endopeptase, but it appears to correspond fairly well with the peptonizing factor in trypsin.

Concerning fungus desamidase, II. PRINGSHEIM (*Biochem. Ztschr., 12 (1908), No. 1–2, pp. 15–25*).—According to the investigations of the author and others, various fungi, especially yeasts and *Aspergillus niger*, have the ability of splitting off ammonia from nitrogen-containing substances, particularly from amino acids. The action is essentially enzymic, and the name desamidase has been

given the enzym. It retains its active properties to a limited degree when the fungi are treated with acetone and ether, but loses them entirely if expressed under pressure. Material which has been acted upon by desamidase may be further transformed into alcohols through the action of yeasts and the splitting off of carbon dioxid.

Concerning hydrating ferments in various gums, V. Boucher (*Compt. Rend. Soc. Biol.* [*Paris*], *64* (*1908*), *No. 20, pp. 1003, 1004*).—A brief account is given of investigations on the presence of hydrating ferments in various gums. The occurrence of such bodies was first announced in 1885, and this led to the belief that enzyms may play an important part in the formation of gums by plants.

The author has attempted to ascertain the forms of the enzym, and his experiments were conducted with reference to the occurrence of emulsin. An examination of 30 different kinds of gums representing resin gums, tannin gums, and some true resins showed, with one exception, a kino from *Pterocarpus marsupium*, the presence of emulsin capable of splitting up amygdalin. The failure in this case is attributed to the relatively large amount of tannin in the gum.

Preliminary investigations on the oxidizing diastases of plant latex, V. Cayla (*Compt. Rend. Soc. Biol.* [*Paris*], *65* (*1908*), *No. 26, pp. 128–130*).—A preliminary report is given of a study of 18 species of plants, among them many of the best known rubber-producing plants, to determine the occurrence of oxidizing enzyms in their latex.

The results thus far obtained indicate that the latex of all the plants contains oxidizing diastases, and in most of the species studied the form present was oxygenase. In some of the species peroxidase was found, while in a few catalase was recognized. The reactions observed indicate the presence of the same diastase in a given species, no matter what the source of the plant, although the oxidizing ferment was found to differ in a number of very closely related species.

The influence of agitation on the growth of some of the lower fungi, A. Sartory (*Etudes Expérimentales de l'Influence de l'Agitation sur les Champignons Inférieurs. Thesis, Paris, 1908, pp. 142, pls. 20; rev. in Rev. Sci.* [*Paris*], *47* (*1909*), *1, No. 4, pp. 114–116*).—A study was made in liquid and solid media of a number of the lower fungi to determine the effect of shaking on their growth and development. A form of apparatus was devised that would violently shake the vessel containing the cultures at regular intervals.

When subjected to relatively infrequent shakings, 10 to 20 times a minute, the species of Oomycetes, Ascomycetes, and molds developed with little change from the normal growth. When agitated at the rates of from 60 to 120 times per minute marked changes occurred. The thallus-like growth usually formed by the filaments became spherical, a supporting structure was developed, and important changes were induced in the reproductive organs of the fungi. The alcoholic fermentation of yeasts was favored by the agitation.

The influence of light on the growth of Rhizopus nigricans, L. Raybaud (*Compt. Rend. Soc. Biol.* [*Paris*], *64* (*1908*), *No. 23, pp. 1172–1174*).—As a preliminary to a general study of the effect of light on the lower fungi, the author reports the results of investigations on the effect of different colors of light on the growth and development of *R. nigricans*, which, according to Van Tieghem, is neither geotropic nor heliotropic in its growth.

Cultures of the fungus were placed under clear glass and colored screens and the growth noted. Under clear glass phototropism was indicated after about 48 hours, and heliotropism under yellow glass in 4 days. Red rays appeared to exert a peculiar effect. They retarded growth for a short time, but after development began the filaments assumed oblique positions and at the end of

about 3 days they curved downward on to the substratum, over which they spread in their subsequent development. Under no other kind of radiation was such behavior noted. Violet colored light stimulated the production of more and larger sporangia, while the final vegetative growth was greatest under the blue and yellow screens. Growth under the green screens was retarded, the mycelium was less developed, and the sporangia were very small.

The effect of light on germination, W. KINZEL (*Ber. Deut. Bot. Gesell., 26a (1908), No. 9, pp. 655–665*).—A study is reported on the effect of light on the germination of seeds of over 100 species of plants. The seeds were placed to germinate under different degrees of illumination and the effect of light in retarding or hastening the germination is shown. A bibliography of about 80 titles concludes the report.

The chemistry of chlorophyll, S. B. SCHRYVER (*Sci. Prog. Twentieth Cent., 3 (1909), No. 11, pp. 425–449*).—A summary is given of the present state of information regarding the chemistry of chlorophyll, and in the general conclusions the author states that chlorophyll is a magnesium derivative, from which the metal is eliminated readily by means of acid but with great difficulty by alkalis. The green pigment consists in most plants apparently of a mixture of magnesium derivatives, a crystalline chlorophyll, and another chlorophyll or mixture of chlorophylls which are esters of the unsaturated alcohol phytol. The statement is made that there is a considerable amount of evidence which tends to show that an intimate chemical relationship exists between the green pigments of plants and the red pigments of blood.

Studies in chlorophylls, L. MARCHLEWSKI (*Biochem. Ztschr., 10 (1908), No. 1–2, pp. 131–166, pls. 3, dgms. 2*).—Spectroscopic studies have been made of chlorophylls from various sources and their behavior toward acids noted.

The author concludes that chlorophyll, phæophyl, and phyllogen are identical substances, differing in all probability only in the methods of their isolation. He thinks that Hoppe-Seyler's name, chlorophyllan, should be adopted, and if distinctions between the two prominent groups are to be maintained, Tsvett's names, chlorophyllin α and β (E. S. R., 20, p. 739), should be used, or they may be designated as chlorophyllan and allochlorophyllan.

The photodynamic work of chlorophyll extracts, W. HAUSMANN (*Biochem. Ztschr., 12 (1908), No. 3–4, pp. 331–334*).—The author shows that a methyl alcoholic extract of green plants has a marked effect on the red corpuscles of the blood. He experimented with extracts made from leaves of cabbage, maize, wheat, grass, beans, oak, clover, etc., and found that while comparatively inactive in the dark, the extracts induced complete hemolysis within an hour when brought into sunlight.

From these experiments the author concludes that chlorophyll must have a marked photodynamic effect on the assimilation processes of the plant.

The protein changes taking place in green plants when kept in the dark, W. BUTKEWITSCH (*Biochem. Ztschr., 12 (1908), No. 3–4, pp. 314–330, dgm. 1; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 552, II, p. 884*).—Experiments were conducted with beans and oats, in which the protein changes were noted, the total nitrogen, proteid nitrogen, aspartic acid, and ammonia nitrogen being determined. In the case of beans the indigestible and other forms of nitrogen were estimated. The analyses were made of samples of the original material and also of samples which had remained for different lengths of time in the dark.

It was found that there was a decrease of proteid nitrogen and an increase in aspartic acid nitrogen. The nitrogen which was due neither to aspartic acid nor protein first increased and then diminished. The conclusion is drawn that

part of the aspartic acid was formed by secondary changes from products of protein degradation, which include leucin and tyrosin.

Chemical changes due to the wounding of plants, R. Friedrich (*Centbl. Bakt.* [*etc.*], *2. Abt., 21 (1908), No. 10–12, pp. 330–347, fig. 1; abs. in Jour. Chem. Soc.* [*London*], *94 (1908), No. 551, II, p. 774*).—After giving a résumé of previous investigations dealing with the increased evolution of carbon dioxid and the increased production of protein, the author describes experiments with potato tubers, oak leaves, onion bulbs, pear fruits, and other parts of plants, which indicate that a fall in the carbohydrate content is correlated with increased respiration in the portion of the plant under investigation. It was found that the protein produced in wounded potatoes, onions, and pears depended on the presence of a large amount of carbohydrates. In the case of oak leaves there was a decrease in the total nitrogen and an increase in the proteid and amid nitrogen following mutilation of the leaves, and in this respect the fruits of the Japanese quince and the leaves of *Clivia gardneri* behaved in a similar manner.

The observations of the author tend to support the view that protein is formed from plants by a reaction between carbohydrate and amid material.

The action of sulphur dioxid on plants, A. Wieler (*Naturw. Rundschau, 22 (1907), No. 18, p. 229; abs. in Zentbl. Agr. Chem., 37 (1908), No. 8, pp. 572, 573; Jour. Chem. Soc.* [*London*], *94 (1908), No. 552, II, p. 887*).—The author shows that assimilation of carbon dioxid is profoundly influenced by the presence of sulphur dioxid, but respiration is not affected. An examination made of leaves from districts where sulphur dioxid caused injury showed that this substance was present in the leaf, although only in small quantities. When the leaves were collected close to the source of the gas larger amounts were found. The sulphur dioxid apparently enters through the stomata and causes greater injury in wet than in dry weather.

There is some evidence that other factors come into play besides the direct action of sulphur dioxid in the leaf. As the soils in the district where the injury arises are decidedly acid, it is believed that the injury could be overcome to a considerable extent by the use of suitable fertilizers and in particular by liming the soil.

A new group of plants containing hydrocyanic acid, M. Greshoff (*Pharm. Weekbl., 45 (1908), pp. 1165–1169; abs. in Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 12, pp. 554, 555*).—Investigations made with *Triglochin maritimum*, *T. palustre*, and *Scheuchzeria palustris*, plants belonging to the natural order Juncaginaceæ, have shown that they contain hydrocyanic acid. The investigations indicate that probably it exists in the form of a glucosid analogous to linamarin.

Centaurea aspera, a plant containing hydrocyanic acid, C. Gerber and J. Cotte (*Compt. Rend. Soc. Biol.* [*Paris*], *65 (1908), No. 26, pp. 185, 186*).—While making a distillate from *C. aspera*, the authors were struck with the odor of hydrocyanic acid, and an investigation showed the presence in different parts of the plant of a glucosid yielding it. The glucosid was found principally in the green part of the plant, and in the basal leaves, which were dead and dry. The amount varied from 0.842 gm. per thousand in the green leaves, 0.610 in entire young plants, and 0.252 in the dead basal leaves, to traces in the old stems and roots. The glucosid is probably identical with amygdalin.

Seeds and plants imported during the period from April 1 to June 30, 1908. Inventory No. 15 (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 142, pp. 81*).—This is the fifteenth inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction, comprising 812 numbers imported between the

dates of April 1 and June 30, 1908, and consisting mainly of material collected by F. N. Meyer, agricultural explorer in northern and central China.

FIELD CROPS.

Dry farming investigations in Montana, A. Atkinson and J. B. Nelson (*Montana Sta. Bul. 74, pp. 65–89, pls. 10, map 1*).—This bulletin presents data gathered during the past 4 years at several substations located in different parts of the State. Data regarding precipitation, given in a table, were taken from observations made either at the substations or by the nearest Weather Bureau station. General directions for dry-land farming are given.

It is concluded from the results thus far secured that dry farming can be profitably practiced in many parts of the State. Turkey Red wheat sown in the fall gave the best yields of all crops grown. Yields of 55 and 58 bu. per acre are recorded. Fall-sown rye also gave very good yields, over 40 bu. per acre being secured in some instances. Satisfactory yields of potatoes were obtained, the average being about 124 bu. per acre. Brome grass was the most promising forage crop tested.

Other experimental results indicate that using from 3 to 5 pk. of seed per acre in growing the different grains is better than using larger amounts. Planting grain crops to permit intertillage reduced the yield as compared with planting sufficiently deep with the ordinary seed drill. Alternating grain with a properly cultivated summer fallow gave decidedly more profitable returns than continuous grain culture on the same land. The importance of keeping the summer fallow well cultivated was also plainly brought out by these experiments.

Alfalfa in cultivated rows for seed production in semiarid regions, C. J. Brand and J. M. Westgate (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 24, pp. 23, figs. 3*).—Historical notes with reference to this method of culture are given, the principles underlying alfalfa seed production are considered, and directions for growing alfalfa in cultivated rows for seed are presented.

It has been observed that isolation of alfalfa plants increases seed production, and this is considered due largely to the increased amount of sunlight available when the plants shade each other but little or not at all. At the Arlington Experimental Farm, plants secured from cuttings taken from a heavy-seeding plant produced a maximum of 38 pods when the area per plant was equivalent to a 7-in. square, and 96 pods when the space was equal to an 11-in. square, while the highest number of pods on plants in rows 39 in. apart and 18 in. apart in the row was 505.

The authors and other investigators have found that alfalfa flowers tripped by any form of manipulation set seed much more readily than unexploded blossoms. In an experiment at the Arlington Experimental Farm, plants the flowers of which were tripped by exerting pressure successively over the whole plant showed an increase of 25.5 per cent in the yield of pods over adjoining untreated rows. At Chico, Cal., an increase of 129 per cent in the number of pods is recorded. The results of two experiments have shown that the proportion of increase in the number of seeds is not so high as in the number of pods.

Growing alfalfa for seed in cultivated rows promises to be more successful in sections with an annual rainfall of 14 to 20 in. than elsewhere. "The results obtained in the experiments thus far conducted indicate that it gives especial promise in Utah, in eastern Colorado, and in the western portions of Kansas, Nebraska, and South Dakota. Yields of seed at the rate of 5 bu. to the acre have been obtained." A number of methods used in the preparation of the seed bed, the seeding in rows, and the cultivation and harvesting of the crop

are described. The yields per acre when alfalfa is grown by this method are estimated as follows:

Estimated yield of hay and seed to the acre when alfalfa is grown in cultivated rows.

Variety.	Green weight of hay.	Dry weight of hay.	Weight of seed.
	Pounds.	*Pounds.*	*Pounds.*
Dry-land alfalfa (Brotts)	2,672	1,154	167
Commercial sand lucern (S. P. I. No. 20451)	3,463	1,359	143
Turkestan alfalfa (S. P. I. No. 18751)	2,141	908	62

It is stated that heavy seed crops are to a large extent dependent upon a certain amount of dry weather and heat when the seed is setting. At this stage the plant requires but a small supply of moisture.

Alfalfa yields, 1908, F. D. Stevens (*Alabama Canebrake Sta. Bul. 26, pp. 18–20*).—In 1908 the following quantities of well-cured hay were secured from a field of 6.3 acres at the five different cuttings: April 9, 13,600 lbs.; May 28, 13,305 lbs.; June 29, 7,547 lbs.; August 5, 11,689 lbs.; and September 10, 3,110 lbs.

Comparative variety tests with fodder beets, J. J. Vaňha and O. Kyas (*Ztschr. Landw. Versuchsw. Osterr., 11 (1908), No. 12, pp. 864–887*).—Experiments were conducted with 8 varieties for 2 years. The results are tabulated and discussed at length and each of the different varieties is described. In summarizing the results with reference to both yield and quality the varieties ranked in the following order: Vauriak, Erfurt, Leutewitz, Mamut, Oberndorf, Chrestensen, Eckendorf, and Askania-Eckendorf.

The general conclusion is drawn that the influence of weather and soil fertility is much greater than that of variety characteristics.

Comparative culture tests with varieties of fodder beets and a study of the Mauthner treatment of beet seed, O. Kyas, J. Bukovanský, and J. J. Vaňha (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 12, pp. 888–893.*—The Mauthner treatment consists in subjecting the seed to chlorin and sulphuric acid fumes. Results secured under field conditions did not indicate a definite favorable influence due to this method. It was shown that the leaf spot disease of the beet has no connection with the seed and this method of treatment. The injuries resulting from *Uromyces betæ* were generally reduced in the beets grown from treated seed, and the same was true of dry rot.

In decreasing order of yield the varieties grown ranked as follows: Mamut, Red Eckendorf, Oberndorf, and Mauthner Olive Form. The dry matter content was found to be in positive correlation with the sugar content of the beet. The protein content showed no connection with these factors and was practically the same for all varieties.

The sugar-beet crop in the principal European countries from 1898–1908, G. Dureau (*Jour. Fabric. Sucr., 50 (1909), Nos. 4, p. 1, charts 2; 5, p. 1, charts 2; 6, p. 1, charts 2; 7, p. 1, chart 1*).—The production of sugar beets in the principal beet sugar producing countries of Europe for the 10 years, 1898–1908, is discussed and statistics comparing the different countries with each other are presented.

The American sugar-beet growers annual, edited by F. Roderus (*Chicago, Ill., 1908, pp. 100, figs. 115*).—This publication contains a series of articles with reference to the beet-sugar industry in this country and presents numerous statistics concerning the production of sugar beets and beet sugar, together

with data regarding the commerce of this staple and its production throughout the world.

Score cards for dent corn (*Ohio Sta. Circ. 86, pp. 3*).—This circular presents the score cards for use in the final selection of seed ears, in the plant selection for seed corn, and in judging varieties of corn at husking time as adopted by the Ohio Corn Improvement Association November 24, 1908. Explanatory notes on all the points are given.

Fertilizer tests with cotton. F. D. STEVENS (*Alabama Canebrake Sta. Bul. 26, pp. 3–18*).—A computation is presented showing that by disposing of the lint and seed of 18 bales of cotton produced on the station farm in 1907 there was removed from the land 574.2 lbs. of nitrogen, 188.1 lbs. of acid phosphate, and 276.1 lbs. of potash, representing $107.92, $10.72, and $16.20 in money value, respectively.

A comparative fertilizer test on poor red prairie land indicated a net gain in value of lint of 58 cts. per acre from the use of 200 lbs. of cotton-seed meal, $3.56 from 240 lbs. of acid phosphate, and $3.70 from a combination of these two applications. The results of a more extended trial show the greatest net gain from using 160 lbs. of cotton-seed meal and 240 lbs. of acid phosphate. In this case the net profit was $4.52 per acre, while the use of 160 lbs. of kainit in addition to this application resulted in a loss of $3.67. The use of the kainit alone produced a net gain of $1.53 per acre.

The results of a third experiment reported again show the value of applying cotton-seed meal with acid phosphate. An application of 230 lbs. of cotton-seed meal and 320 lbs. of acid phosphate was used at a profit of $5.75 per acre, which was surpassed only by the use of 100 lbs. of nitrate of soda giving a net profit of $11.57.

On dark prairie soil the best net gain per acre was also made by using nitrate of soda alone, but it amounted to only $5.32. Applying the nitrate with acid phosphate in the scooter furrow before planting and using acid phosphate alone resulted in losses. In another test on this black calcareous prairie soil the largest net gain, $12.48 per acre, was secured where 200 lbs. of nitrate of soda and 200 lbs. of cotton-seed meal per acre had been given. The addition of 200 lbs. each of kainit and acid phosphate reduced this gain to $6.02. When the cotton-seed meal was omitted a loss of $7.97 was sustained, and when nitrate of soda was replaced by cotton-seed meal a loss of $9.21 per acre. The least profitable application consisted of 200 lbs. each of kainit and acid phosphate, which resulted in a loss of $10.60.

Heavy annual applications of commercial fertilizers on land growing cotton for five consecutive years gave the largest increase in yield during the first 2 years, the returns being more than doubled as compared with the yields on untreated land. A comparative test of alfalfa and cotton showed that alfalfa was much more profitable. Alfalfa turned under apparently increased the yield of seed cotton of the following cotton crop by 622 lbs.

Among a series of winter cover crops crimson clover seemed most efficient in increasing the cotton yield. Crushed lime rock on poor red prairie upland reduced the yield. The cowpea sown broadcast in standing corn alternated with cotton was found efficient in maintaining the fertility of the soil.

Recent experiments with oats. C. G. WILLIAMS (*Ohio Sta. Circ. 88, pp. 8*).—Among the 25 best varieties of oats grown at the Ohio Station, Siberian, Sixty Day, Improved American, Illinois German, Joanette, Green Mountain, and Big Four led in productive capacity, the range in yield of grain being on the average for the 5 years from 68.34 bu. for the last mentioned variety to 70.46 bu. for the first mentioned.

In 1908 a number of new varieties were introduced from abroad. White Ligowa and Hvitling gave promising results. The seed of these selections tested above 40 lbs. per bushel and that of Gartons Regenerated Swedish Select 46 lbs., but 1 year's growth in Ohio brought the weight per bushel down to that of normal Ohio oats. Seed of Siberian and Joanette oats was introduced from Canada in 1904 and these varieties have been grown each season to 1908, inclusive. The results showed that this northern-grown seed gave about as satisfactory results as similar native varieties and they did about as well the first year as they did in succeeding seasons.

The general average results of experiments with different rates of seeding showed that 11 pk. of seed per acre gave the highest yield of grain, the increase being a little more than needed to pay for the extra seed. Wideawake and Seizure produced the most straw in proportion to grain of any of the varieties reported.

Barley and other spring grains were grown for the purpose of finding a substitute for oats or winter wheat, and of the different crops so tested Oderbruck barley was apparently a close competitor of oats. A variety of winter oats has been developed by the station from self-sown plants of a spring crop and which went through the winter of 1905–6. In 1907 this strain of winter oats yielded at the rate of 46.41 bu. per acre, as compared with 44.24 bu. for spring oats. In 1908 the yield was 66.56 bu. per acre, while the average of all the spring varieties tested was 61.51 bu. The first year the bushel weight exceeded that of the spring varieties by 3.08 lbs. and the second year by 8.92 lbs. The variety also ripens from 8 to 10 days earlier than the average of the spring varieties. The variety will be tested further before it is recommended.

Varieties of potatoes grown in the Central Provinces, G. Evans (*Dept. Agr. Cent. Prov. and Berar [India Bul.], pp. 13, pls. 2*).—The four common varieties, Italian, Patna, Naini Tal, and Deshi or Moolkhi, grown in the Central Provinces, are described and the methods of potato culture practiced are discussed.

Culture and preparation of sisal, A. Marquès (*Culture et Préparation du Sisal. Paris, 1909, pp. 97, pls. 11, figs. 4*).—This book contains a description of the sisal plant (*Agave sisalana*), together with its culture and the preparation of the fiber, as observed by the author in the Hawaiian Islands.

The soy bean: A comparison with the cowpea, C. A. Mooers (*Tennessee Sta. Bul. 82, pp. 75–104, figs. 14*).—In comparing the two plants the author enumerates the prominent qualities of each and points out that the cowpea is preferable for planting either with corn or sorghum and generally for seeding broadcast, while the soy bean appears the more valuable of the two crops when grown as a grain producer, as an intensive farm crop, and as an early grain or hay crop.

The best varieties of soy beans are more certain to produce high yields of seed than any of the cowpeas. In 1907, Mammoth Yellow soy bean planted June 17 yielded 28.4 bu., and planted June 29, 26.6 bu. of seed per acre. Medium Yellow soy bean planted July 15 produced 20.2 bu. On the other hand, Whippoorwill cowpea produced 27.7 bu. of seed per acre from the planting made June 17, 18.8 bu. from the planting June 29, and no seed from the one made July 15.

Soy beans at the station have proved more resistant to light frosts than the cowpea and also less sensitive to cool weather in the spring. Other points of comparison favorable to the soy bean are a higher protein and fat content, freedom from weevil attacks in the seed, the ripening of the seed at one time, and the ease of harvesting and thrashing the crop.

Analyses made at the station show an average protein content of 35.40 per cent and a fat content of 20.35 per cent for soy-bean seed, as compared with 25.28 per cent of protein and 1.72 per cent of fat for the cowpea.

A stand of cowpeas is more certain than a stand of soy beans because a soil crust offers but little resistance to the cowpea and the seed is also surer of germination. For sowing broadcast the cowpea is therefore superior to the soy bean, especially on land likely to bake or poorly prepared. A variety test of soy beans showed Butterball to be a good early variety, B. P. I. No. 1299 the best variety in the test for August planting and for an extra early seed crop, Ito San about the best early variety, B. P. I. No. 1194 about the best of the mid-season varieties, and Mammoth Yellow about the best late variety.

Variations in length of season required for full maturity, as observed in 1907, were as follows: "Mammoth Yellow, 186 and 113 days, yielding 21.5 and 26.6 bu. of seed, respectively; Ito San, 129 and 81 days, yielding 11 and 16.5 bu. of seed, respectively; Medium Yellow, 164 and 86 days, yielding 18.3 and 20.2 bu. of seed respectively." Varieties of cowpeas also showed marked variations in length of season, but the difference between the two plants is that late-sown soy beans make only a small growth, while late-sown cowpeas grow with the usual vigor until arrested by frost or other untoward conditions.

Cultural directions with reference to the soy bean are given and varieties of special merit are enumerated. The construction of curing racks for hay is described and illustrated and the results with soy beans in cooperative experiments in middle Tennessee are briefly reported.

The plant food consumption of the beet during the first year of growth and its relation to the sugar content, K. Andrlík and J Urban (*Ztschr. Zuckerindus. Böhmen, 33 (1909), No. 4, pp. 221–240*).—The results of experiments showed that the plant food consumption varied with different varieties or strains. The plants of one kind of seed took up more phosphoric acid and potash than those grown from another kind, while in nitrogen consumption there was no difference. Disregarding this difference and basing conclusions on average results, the authors estimate the plant food consumption of a crop of 400 quintals of beets per hectare (about 17.8 tons per acre) as 65.1 kg. (about 143.2 lbs.) of phosphoric acid, 139.8 kg. (about 307.6 lbs.) of nitrogen, and 168.6 kg. (about 370.9 lbs.) of potash. Attention is called to the fact that aside from the difference in seed, conditions of soil and season have a marked influence and that the deductions are based on the assumption that weather conditions are favorable.

Experiments with varieties of sugar cane, F. Watts et al. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1906–7, pt. 1, pp. 74*).—Noted from another source (E. S. R., 20, p. 639).

Manurial experiments, F. Watts et al. (*Imp. Dept. Agr. West Indies, Sugar-Cane Expts. Leeward Isl., 1906–7, pt. 2, pp. 37, dgms. 5*).—Noted from another source (E. S. R., 20, p. 639).

Shelter-tent experiment with Sumatra-type tobacco, W. Frear (*Pennsylvania Sta. Bul. 89, pp. 3–14, figs. 2*).—Sumatra leaf was grown under shelter in 1905 at two locations on Penn sandy loam soil. Plants from commercial seed showed great diversity of type, while those from self-fertilized seed grown in Pennsylvania in 1904 showed a marked uniformity. Crops of cured leaf weighing 1,200 and 1,700 lbs. per acre were secured at Milton Grove and Cocalico, respectively.

Sweating and assorting caused a loss of 21.7 per cent. "The tobacco was bulked on February 16, 1906; the temperature rose from 70° F., at the beginning, to 100° on February 25, and then fell to 96° on March 2. On March 3 the bulk was turned; on the 4th the temperature was 84°; on the 12th, 100°;

and on the 17th, 92°. On March 18, 30 days after the beginning of the sweat, the bulk was taken up and assorted."

The cured leaf consisted of about 75 per cent of wrappers and 25 per cent "seconds." Of the wrappers 45 per cent were light, 30 per cent medium, and 27 per cent dark. Sixty per cent of the leaves were over 16 in. long. In capacity, life, and burning quality the 1905 crop was superior to the crop of 1904, and showed a general rating above all domestic Sumatra-type tobacco except the better Georgia and Florida grades. The cured leaf was produced at Cocalico at a cost of 45 cts. per pound. It is believed that the cost per pound of producing the sweated and sorted leaf will not be over 65 to 70 cts. The items of expense are given in a table.

Principles and practical methods of curing tobacco, W. W. Garner (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 143, pp. 54, figs. 10*).—This bulletin discusses the principles of curing tobacco and presents practical methods of curing as applied to the various types. The discussion of the principles of curing includes a description of the air-curing and flue-curing processes, as well as of the method of curing with open fires. The different types of tobacco considered are cigar tobaccos, shade-grown cigar-wrapper leaf, Burley, sun-cured, yellow, heavy export, and Perique tobaccos.

Outlines of tobacco barn construction are given and appliances used in harvesting, handling, and curing tobacco are described.

Foreign tobaccos, L. P. de Bussy (*Meded. Deli-Proefstat. Medan, 3 (1909), No. 4, pp. 122–151*).—Brief reports are given on culture tests with varieties of tobacco secured from different countries, including the United States. Among varieties from the United States, Cooley hybrid gave a much better product than Brewer hybrid.

The production of wheat in the British Empire, A. E. Humphries (*Jour. Roy. Soc. Arts, 57 (1909), No. 2934, pp. 230–253*).—This article discusses the production of wheat in the United Kingdom, Australia, Canada, India, New Zealand, South Africa, and British East Africa, and presents statistics for a number of years with reference to acreage, yield, and exports and imports of wheat.

Wheat and other cereals, D. Zolla (*Le Blé et les Céréales. Paris, 1909, pp. VII+298, dgms. 18*).—This book discusses the wheat industry of France from the standpoint of rural and national economics and considers in this connection the imports and exports of wheat, the profits in wheat culture, variations in price, and the influence of agricultural organizations on the price. A chapter each is devoted to a special study of the Paris grain market and its commercial organization.

Wheat fields and markets of the world, R. E. Smith (*St. Louis, Mo., 1908, pp. 418, dgms. 2*).—Part 1 of this book treats of what in the world's commerce and the possibility of increasing the world's wheat crop and reviews the conditions with reference to the production and commerce of wheat in different wheat importing and exporting countries. Part 2 describes the principal wheat markets of the world, such as the Chicago Board of Trade and the grain markets of London, Berlin, and Paris. Descriptions of the London, Berlin, and Paris stock exchanges are given in an appendix.

The grain production of the world in 1908 (*Veröffentl. K. Ung. Ackerb. Min., 1908, No. 15, pp. 108*).—Estimates of the production of different grain crops in 16 grain importing countries and 21 grain exporting countries are presented.

Cereal culture, F. Schindler (*Der Getreidebau. Berlin, 1909, pp. XII+466, figs. 80*).—This book contains a general discussion of the cereals, with special reference to their botanical and agricultural characteristics, and gives descrip-

tions of rye, wheat, barley, oats, corn, millet, and rice. Detailed cultural directions for each crop are presented.

Principal crops of the world, O. Warburg and J. E. Van Someren Brand (*Kulturpflanzen der Weltwirtschaft. Leipsic [1908], pp. XIV+411, pls. 12, figs. 653*).—Discussions of the following crops are presented: Rice, wheat, maize, sugar, grapes, coffee, tea, cacao, tobacco, and cotton.

HORTICULTURE.

Ninth report of the Woburn Experimental Fruit Farm, Duke of Bedford and S. U. Pickering (*Woburn Expl. Fruit Farm Rpt., 9 (1908), pp. 95+XLVII, pls. 6*).—An account is given of an extensive series of experiments on methods of planting fruit trees which were conducted with the view of verifying the results secured by the authors along this line for the 10 years prior to 1905 (E. S. R., 17, p. 559), and in which the majority of the evidence went to show that trees which were carelessly planted, that is, planted with the roots just as they happened to come, into holes too small for them, filling in the dirt without working it around the roots and severely packing it, gave a more vigorous tree growth at the end of 3 or 4 years than trees carefully planted according to accepted methods. With the view of making the experiments sufficiently numerous to render the results accurate, 2,000 trees, planted by some 10 different hands in 17 different localities and in 8 different counties, were included in the work. The trees were for the most part dwarf apples, though some plums and bush fruits were used. The results secured in the various experiments are tabulated and fully discussed.

An appendix to this report consists of the following papers by S. U. Pickering, which are elsewhere noted from another source: Studies on Germination and Plant Growth (E. S. R., 20, p. 737); The Action of Heat and Antiseptics on Soils (p. 1015).

In the comparative test of orthodox and careless methods of planting the trees the ramming process was very severe. The tree, with the roots just as they happened to come, was set in a shallow hole. The hole was then filled up and the earth thoroughly puddled with a heavy rammer until the whole mass "shook like jelly at each stroke." A shovelful of loose earth was thrown over the surface so as to render hoeing possible. Both rammed and unrammed trees were hoed and kept free from weeds. The ground about the rammed trees remained quite hard for the 12 months following the planting and could be distinguished even during the second and third years.

Summing up the evidence obtained during the first 2 years from these recent experiments, it was found that although the ramming appeared to check the growth of the tree during the early part of the first season about 40 per cent more new wood was formed with the rammed trees during the first year after planting than when the trees were planted carefully. There was a still greater increase of new wood during the second year, but with some of the trees examined during the third season the excess rate of growth appeared to be slackening. The excess of branch formation is attributed to a similar excess of root formation. The actual shoots on the rammed trees were thicker than on the unrammed trees.

The authors advance the opinion that the form of planting which aims at avoiding all injury to the roots is really the one which should be designated as bad practice, since the object to be sought in planting a tree is to secure the development of fresh rootlets from the main roots rather than to preserve existing fibrous roots, which, having lost their tips, are of little value to the tree. Ramming the soil hastens the development of adventitious roots by

creating an intimate contact between the roots and the soil. Although soil which has been puddled so severely is in an unsuitable condition for vegetation, the ramming takes place only over the roots themselves, and before the end of the first season the new roots are found to have penetrated beyond the puddled earth. Trimming the roots back ¼ to ⅓ of their length was found to be advantageous since it stimulated the development of fibrous roots. It is conceded that rammed trees may fruit somewhat less during the first few years in consequence of the more vigorous growth, although no such reduction was noted in some cases under observation. Ramming can have little or no effect in light, sandy soils.

Unsuccessful attempts were made to secure beneficial effects similar to those which resulted from ramming the tree by both plastering the roots with various substances and by surrounding the roots with very fine sand.

From the results thus far secured, the authors are of the opinion that trenching or deep cultivation will benefit trees only where it materially improves the drainage and where the subsoil is sufficiently rich to encourage fruit development.

Autumn was found to be the best time to plant trees during the dormant season. In such early plantings the adventitious roots were in most cases formed before the following January. The formation of adventitious roots was greatest in cases where the roots had been most damaged in the lifting and where they had not been trimmed. The authors are at a loss to explain the benefit to be derived from not trimming the injured roots, and advise that they be trimmed, owing to the danger from penetration of fungi.

Comparative tests of the hexagonal, square, and rectangular planting systems resulted only slightly in favor of the hexagonal arrangement and were not sufficient to counterbalance the disadvantage of the narrower alleys between the trees. No material advantage was found in running the rows of trees north to south and east to west as compared with running them northeast, southwest, etc.

Contribution to the study of the injection of nutrients into fruit trees, G. Fron (*Jour. Soc. Nat. Hort. France, 4. ser., 10 (1909), pp. 54–59, figs. 2*).—The author reports on some experiments conducted during the past 2 seasons in the injection of nutritive fluids into the stems of fruit trees according to the method used by J. M. Simon (E. S. R., 18, p. 636). He gives a detailed account of the work as conducted with some pear trees, in which sulphate of iron was used as a nutrient in one case and nitrate of lime in the other. Both solutions appear to have increased the vigor of the trees. In most of the experiments, however, the improvement was confined to a small portion of the tree. The author is of the opinion that although this method of treating trees is of little value in practical fruit culture it might, if carried on for several years, serve as a guide for determining which elements should be added to the soil. His experiments are to be continued.

A radical change in the method of determining fruit varieties, A. Janson (*Gartenwelt, 12 (1908), No. 63, pp. 746–748*).—The author points out the difficulties of correctly identifying little known varieties of fruits, and discusses the possibilities of classifying fruits by means of their specific weights.

Preliminary tests of this method lead the author to conclude that, as soon as sufficient data have been gathered relative to the specific weights of the known varieties of fruit, specimens can be easily identified by a comparison of their specific and molecular weights. The desirability of further comparison with the pomological descriptions is pointed out, since there might be a similarity of weight between certain hybrids or little known fruits and some of the varieties which had previously been determined. The method is to be tested further.

The specific weight of fruit varieties, H. Zimmerman (*Gartenwelt, 13 (1909), No. 4, pp. 39–41*).—The author, having tested the value of the specific gravity of apples as a means of determining varieties, in accordance with the method noted (see p. 1035), arrives at the conclusion that the specific densities of various heavy fruits of the same variety are not sufficiently constant to be used as a distinguishing character.

In order to determine whether the differences in the size of the air spaces in the core influence the specific weight, several apples were quartered and the core removed. The specific density was then determined for each quarter. From the data secured it is concluded that the specific density is not affected by the air spaces in the core, but is influenced by the general structure and composition of the apple.

Papers read at the summer meeting of the Ohio State Horticultural Society (*Ohio Sta. Circ. 87, pp. 13*).—This circular contains the full text of the various addresses and papers delivered at the summer meeting of the Ohio State Horticultural Society, as follows: Orchard Renewal, by S. R. Gill; Spraying for Apple Scab in 1908, and Proposed Spray Mixtures for Orchard Use, by A. D. Selby; two papers on Control of Pear Blight in Northern Ohio, by R. A. Hunt and W. Miller, respectively; and Experimental Notes of the Season, by H. A. Gossard. The last-named paper deals with spraying experiments with fruit trees.

French gardening, or intensive cultivation on the French system, T. Newsome (*London, 1908, pp. 83, pls. 4, figs. 27*).—A popular work on this subject in which the author discusses the principles involved in intensive French vegetable gardening, and gives the history of French gardens in England, together with the details of the equipment required for such work, and its cost.

Sugar corn and tomatoes, T. H. McHatton (*Georgia Sta. Bul. 82, pp. 175–207, figs. 14*).—The station inaugurated in 1908 a series of culture experiments to determine the possibilities of growing the ordinary vegetables under Georgia conditions. Sugar corn and tomatoes were the crops tested during the past season. This bulletin contains an account of the experiments, including the notes and data secured. It is stated that the work has not been continued sufficiently long to warrant definite conclusions.

In the work with sweet corn special study was made of the relation between the time of planting and the subsequent crop, as indicated by the yield, sugar content, percentage of smut, and injury by corn ear-worm. Five varieties were grown and plantings were made one week apart from May 6 to June 10, inclusive. Different varieties behaved differently, but the results as a whole for the season, which was an unusually dry one, indicate the third week in May is the best time for planting sugar corn. Smut and the corn ear-worm were the prevalent troubles, the smut affecting from 2.33 per cent to 37.57 per cent of the crop and the corn ear-worm from 60.7 per cent to 100 per cent of the crop. The early plantings were injured most by smut and the late plantings by the corn ear-worm.

In the tomato work a comparative test was made of barnyard manure, acid phosphate, muriate of potash, nitrate of soda, and a complete chemical fertilizer, relative to their influence on the yield and quality of the crop. A test was also made of the mulched, unmulched, and staked systems of culture. The results for 1908 indicate that either barnyard manure or a complete chemical fertilizer gives better yields than any of the chemicals used alone. The acid phosphate plat showed the smallest percentage of diseased plants, and the nitrate of soda plat the highest. The complete fertilizer plat gave the best quality fruit, followed by that fertilized with nitrate of soda. The best yields were secured

on the mulched plat and the poorest on the staked plat. Fruits grown on the staked plat showed the greater percentage of disease. There was very little difference between the mulched and unmulched plats as to disease. On the whole the vines were free from insect pests and comparatively so from disease.

In addition to the discussion of the experimental work, descriptive notes are given on the principal diseases and pests affecting sweet corn and tomatoes, including directions for their control.

[The selection of tomatoes for a higher yield], J. Troop and C. G. Woodbury (*Indiana Sta. Rpt. 1908, pp. 27–28*).—The station is studying the influence on the yield of selecting seed from the heaviest yielding individual plants. The previous season's results showed a variation of about 600 per cent in total yield between the best and poorest plants. About 200 plants were used in this season's work, and records were kept of the yield of each plant at each picking. The highest yield per single plant was 15.06 lbs., and the lowest 1.68 lbs., or a difference of nearly 900 per cent. The highest number of fruits per single plant was 91, and the lowest, 18. No definite conclusions are drawn, but from the season's results Hummer, Chalk Early Jewel, and Stone, in the order named, were the most profitable varieties to grow.

Raspberries, blackberries, and loganberries in Washington, W. S. Thornber (*Washington Sta. Bul. 87, pp. 3–32, figs. 17*).—This bulletin contains practical suggestions for growing, harvesting and shipping raspberries, blackberries and loganberries, together with descriptive notes on the most promising varieties.

Factors affecting the keeping quality of table grapes while in transit and in storage (*U. S. Dept. Agr., Bur. Plant Indus. Doc. 392, pp. 3*).—This circular contains some of the more important results secured in the cold storage experiments with table grapes in California conducted by the Bureau of Plant Industry in 1906–7, and was issued to call to the special attention of grape growers and shippers the value of careful handling, and quick shipment and cooling. The data have been noted from another source (E. S. R., 20, p. 840).

The Rixford: A new type of Smyrna fig, W. T. Swingle (*Pacific Rural Press, 77 (1909), No. 9, pp. 161, 170, figs. 2*).—A popular description is given of a new type of drying fig recently discovered in California which it is believed may prove of value in climates too moist for the successful curing of figs of the ordinary Smyrna type.

These new figs, of which two varieties have been discovered, are designated as self-sealed figs, since the narrow mouth of the fruit, when it matures, is found to be sealed with a drop of pellucid gum. As the figs dry and shrivel on the tree the drop of gum hardens and hermetically seals the mouth, thus preventing the entrance of beetles, pomace flies, and other insects. Since the fermentation germs are unable to enter the fig it does not readily sour. One of the varieties was found to withstand soaking rains uninjured, whereas the figs on the adjoining trees which were not sealed were ruined.

Notes are also given on other promising varieties of figs for California.

The first season with the peach orchard, M. A. Blake (*New Jersey Stas. Bul. 219, pp. 3–27, pls. 10, dgm. 1*).—The stations have 2 young experimental peach orchards which were established for the purpose of investigating various problems which arise in connection with the industry and to assist in placing the peach industry of the State on a firmer basis. Accurate accounts are being kept of the expense of the various cultural operations, some data on which have been previously reported (E. S. R., 19, p. 1037).

This bulletin discusses the details of planting and caring for young peach trees, including the selection of site, soil, purchase and cost of trees, varieties,

fall and spring planting, treatment previous to planting, preparation of land, laying out the orchard, planting operations, fertilizers, intercropping, summer pruning, growth of the trees, and expenses of the first season.

Report of progress with citrus fruits, S. A. Wasciika (*Texas Sta. Bul. 118, pp. 3–11, figs. 6*).—This bulletin was prepared with the view of meeting the numerous requests for information concerning citrus fruit culture in south and southwest Texas, and is based upon the experience gained from recently established experimental plantings at the Beeville Substation, as well as upon information gathered from other sources. Although the advice given is not considered conclusive, the belief is expressed that it will prove of value to prospective planters.

Oranges, grape fruit, lemons, and kumquats have made satisfactory growth. Winter temperatures along the coast belt have been too mild for the most part during the past 5 years to test the endurance of the citrus trees. During the past January, however, they withstood a temperature of from 20 to 24° F. Brief notes are given on the preparation of the land, planting operations, varieties, stock for citrus trees, notes on the behavior of the different citrus fruits at the station, cultivation, cover crops, winter protection, pruning, insects, and diseases. The Satsuma orange is the hardiest orange and will resist more cold than any other orange. The Dugat appears to be the next hardiest. Both varieties are young and heavy bearers. On account of its hardiness *Citrus trifoliata* is preferred as a stock for oranges, lemons, and grape fruit. Several varieties of grape fruit tested at the station proved to be heavy bearers the third year after planting. One-year-old lemon trees planted in February, 1904, bore as high as 164 lemons of excellent quality in 1908. The kumquats also are very young and prolific bearers, setting a crop of fruit the first year after planting.

Cacao culture in West Africa, A. Chevalier (*Vég. Utiles Afrique Trop. Franç., 1908, No. 1, pp. 245, pl. 1, figs. 8*).—This is a treatise on cacao culture with special reference to the development of the industry in French West Africa. In part 1 general consideration is given to the botany, geographic distribution, production and consumption of cacao. Part 2 consists of a detailed account of cacao culture in the islands of St. Thomas and Principe. Part 3 discusses cacao culture in other countries of West Africa. In part 4 the author presents his conclusions relative to the best means of developing the cacao industry in the French colonies of West Africa.

Relationship and classification of the Italian varieties of the almond (Amygdalus communis). A. Biasco (*Separate from Ann. R. Scuola Sup. Agr. Portici, 2. ser., 8 (1908), pp. 40*).—The author discusses the opinions of several writers relative to the relationship of the almonds, and proposes a new scheme for classification, according to which he has arranged the Italian varieties of almonds.

List of herbaceous perennials tested in the arboretum and botanic garden Central Experimental Farm, Ottawa, Canada, with descriptions of flowers, and other notes, W. T. Macoun (*Canada Cent. Expt. Farm Bul. 5, 2. ser., pp. 112, pls. 6*).—The purposes of this bulletin are to assist in the correct naming of varieties, and to bring into greater prominence such useful and hardy species as are worthy of general cultivation. The species and varieties are arranged alphabetically under their scientific names. Common names are given wherever known, as well as the native habitat of the plants. Other data presented are the year when planted, the height to which the plant grows, degree of hardiness, time of blooming and the color of flowers. Introductory notes deal with the planting and care of herbaceous perennials.

Sweet peas and their cultivation for home and exhibition. C. H. CURTIS (*London, 1908, pp. 90, pl. 1, figs. 14*).—A popular treatise dealing with the history and development of sweet peas and their cultivation for garden decoration, home use, and exhibition.

FORESTRY.

Second report of the Royal Commission appointed to inquire into and to report on certain questions affecting coast erosion, the reclamation of tidal lands, and afforestation in the United Kingdom (*Roy. Com. Coast Erosion and Afforest. [Gt. Brit.] Rpt., 2 (1909), pt. 1, pp. X+48*).—A Royal Commission was appointed in July, 1906, to inquire as to the encroachment of the sea on various parts of the United Kingdom and to report on the best means of preventing this encroachment, and the reclamation of tidal lands. Subsequently the commission was directed to determine the advisability of establishing afforestation experiments on these waste lands as a means of increasing employment during periods of depression in the labor market.

This report deals with the afforestation phase alone. Section 1 discusses the present unsatisfactory condition of British woodlands, the causes thereof, the natural conditions in the United Kingdom favorable to the growth of trees, and instances of successful results of British forestry. Some lessons are drawn from German methods and results, and considerable data from various sources are given relative to the scarcity of timber, and rise of price.

The succeeding sections of the report discuss in detail unemployed labor in relation to afforestation, the nature and extent of lands suitable for this work, administration, finance, and a summary of the principal conclusions and recommendations.

The commissioners conclude that the soil and climate in the islands are favorable to the production of high-class timber if scientific methods of afforestation be pursued, and that silviculture should prove a safe and remunerative investment. The amount of land suitable for afforestation not now under timber is estimated at about 9,000,000 acres, somewhat irregularly distributed throughout the United Kingdom. It is recommended that a special board of commissioners be appointed to carry out a national scheme of afforestation for this land. The annual sum required for the full scheme as outlined is £2,000,000, the interest on the loan to be defrayed by taxation. It is calculated that the net deficit will be £90,000 in the first year and will rise progressively to £3,131,250 in the fortieth year, after which period the forest will become more than self-supporting. The net revenue from the forest after 80 years, based upon present prices, is estimated at £17,500,000. The best rotation to secure sustained timber yields requires 150,000 acres to be afforested annually. This will provide temporary employment to 18,000 men during the winter months, and permanent employment to 1 man per each 100 acres afforested, in addition to a large number employed in the incidental and subsidiary occupations connected with forestry.

Investigations of the N. C. Geological and Economic Survey relating to forestry problems along the North Carolina banks, J. H. PRATT (*Jour. Elisha Mitchell Sci. Soc., 24 (1908), No. 4, pp. 125–138*).—The author describes the conditions along the North Carolina banks and presents a report of a brief examination of the banks made by J. F. Bond of the Forest Service of this Department. The report includes a discussion of the damage being done by drifting sands on the areas examined and suggests a definite plan by which these lands can be protected.

Second annual report on forest conditions in Ohio, W. J. Green (*Ohio Sta. Bul. 200, pp. 107–126, map 1*).—This is a report on the progress made by the station in forestry work during 1908, together with a general discussion of forest problems to be met in Ohio. The two principal lines of work conducted during the year were the propagation and distribution of forest tree seedlings and the making of a preliminary forest survey through portions of some of the central counties of the State. During 1907 and 1908, 1,287 woodlots aggregating 101,088 acres were examined and suggestions made for improvement.

Forest survey of Litchfield and New Haven counties, Connecticut, A. F. Hawes and R. C. Hawley (*Connecticut State Sta. Bul. 162, pp. 3–47, pls. 6*).—The surveys here reported were made with the chief object of arousing interest in the forest lands of Litchfield and New Haven counties with a view to lead to the adoption of better methods of treatment. The counties are described relative to their location and physiographic features, agricultural and forest lands, forest types, estimates of timber consumption and production, and local market conditions.

Notes are also given showing the forest conditions of the individual towns of each county. Three principal forest types are recognized in the survey: The mixed hardwoods, white pine, and abandoned field types. General suggestions are given for the management of each of these types, as well as for protection against fire and grazing.

Seventh report of the forest commissioner of the State of Maine, E. E. Ring (*Rpt. Forest Comr. Maine, 7 (1908), pp. 103, pls. 6*).—This report includes a résumé of the forest fires of 1907–8, with conclusions and recommendations for future control, an article on white pine blight in Maine, by W. J. Morse, which is noted on page 1047 of this issue, the text of a decision of the State supreme court to regulate the cutting of trees, and a historical account of the wild lands of Maine relative to their acquisition and disposal. The report concludes with an extensive list of Maine islands conveyed by Maine and earlier by Massachusetts, showing the name of the island, situation, and date of conveyance to private parties.

Fifth annual report of the State forester of Massachusetts, F. W. Rane (*Ann. Rpt. State Forester Mass., 5 (1908), pp. 46, pls. 8*).—This is a progress report on forest operations in Massachusetts for 1908. It contains the text of recent forest legislation in Massachusetts, information on the examination of woodlands, and the practical assistance given owners, distribution of nursery stock, activities along forest educational lines, fire protection, publications issued, etc. Data are also given on the forestry work done by the Metropolitan Water and Sewerage Board in connection with the construction of the Wachusett reservoir.

This work was begun in 1898. In all, 1,330 acres were planted to coniferous and deciduous trees up to January 1, 1909. The cost of raising the trees from seed, preparing, planting, and protecting the lands planted until the trees were planted in the field, was $14.92 per thousand trees, or $18.98 per acre (1,390 trees per acre). The annual charge for maintaining efficient fire protection is estimated at 31 cts. per acre. The cost of an improvement thinning is $6 per acre, and it is calculated that such a thinning must be made twice during the first 10 years, after which time the trees should care for themselves.

Annual progress report upon state forest administration in South Australia for the year 1907–8, W. Gill (*Ann. Rpt. State Forest Admin. So. Aust., 1907–8, pp. 11, pls. 6*).—A brief review is given of the year's planting and other forest operations conducted by the woods and forest departments for the year ending June 30, 1908. The data given are similar in character to that contained in previous reports (E. S. R., 19, p. 1148).

Report on forest statistics of Alsace-Lorraine (*Beitr. Forststatis. Elsass-Lothringen, 1909, No. 26, pp. 125*).—This work consists of a statistical account of forest areas, products, revenues, expenditures, etc., for the year 1907, together with a comparative summary for each year since 1870.

The timber industry in north Germany, J. Marchet (*Der Holzhandel Norddeutschlands. Leipsic and Vienna, 1908, pp. VII+227, figs. 19, maps 2*).—A study of the timber industry in various sections of north Germany, with considerable data on production, commerce, prices, etc.

Researches on the woods of different species of African leguminous trees, E. Perrot and G. Gérard (*Vég. Utiles Afrique Trop. Franç., 1907, No. 3, pp. 155, pls. 10, figs. 24*).—This work, which consists of a botanical, scientific, and economic study of different species of African leguminous trees, was undertaken with the view of establishing scientific characters for the identification of the different species by an examination of the woods. The microscopic study of these woods was the important feature of the investigation.

In part 1 consideration is given to the anatomy of the ligneous tissue in its relation to the diagnosis of wood. In part 2 the individual species are considered relative to their botany, wood structure and composition, and economic value. In part 3 the author compares and discusses the important facts brought out in the studies.

An extensive bibliography on the study of woods is given and a series of schedules are appended showing the important data obtained by the microscopical examination of each species.

A Philippine substitute for lignum-vitæ, W. I. Hutchinson ([*Philippine*] *Bur. Forestry Bul. 9, pp. 3–8*).—In view of the rapidly decreasing supply of lignum-vitæ (*Guajacum officinale*) of the West Indies, the Philippine Bureau of Forestry conducted an investigation for the purpose of finding a wood capable of replacing it. As a result of this work, mancono (*Xanthostemon verdugonianus*), the hardest and heaviest of Philippine woods, is recommended as having enough good qualities to serve as a substitute for lignum-vitæ. It is urged that the wood be tried by all hardwood manufacturers, since the species is found in merchantable sizes and quantity and can be cheaply exploited.

The two species are described and compared, and the mancono is discussed relative to its distribution and occurrence, logging operations, cost of labor and transportation. One official test of this wood was made by the U. S. Naval Station at Cavite, in which it was installed in a launch as a bearing for journals rotating in salt water, and was found to be but little worn at the end of 7 months. It is considered to be the equal of lignum-vitæ when both woods are used for bearings on side grain.

Physiological principles involved in the tapping of rubber trees; based on experiments conducted with Hevea brasiliensis, H. Fitting (*Tropenpflanzer. Beihefte, 10 (1909), No. 1, pp. 4–17*).—The author reports on a physiological investigation of various methods of tapping rubber trees, conducted in Java. Various tapping methods were studied relative to their influence on the life of the tree in general and upon the subsequent formation of latex and rubber, and the results of this study are compared with the experience of practical rubber growers. The author recommends and discusses the use of a somewhat modified herring-bone tapping system.

On the plantation, cultivation, and curing of Para Indian rubber (Hevea brasiliensis), H. A. Wickham (*London, 1908, pp. 78, pls. 7, figs. 5, map 1*).—This is a collection of notes on the above topics based upon the author's experience in the tropical region of South America. An account is also given of the introduction of Para rubber from South America to the eastern tropics.

DISEASES OF PLANTS.

Examples of the use of the microscope in investigating plant diseases, O. Appel (*Beispiele zur mikroskopischen Untersuchung von Pflanzenkrankheiten. Berlin, 1908, 2. ed., rev. and enl., pp. 54, figs. 63*).—This is a second edition of the author's contribution on the use of the microscope in the study of plant diseases, and is issued as a separate from Hager and Mez's Das Mikroskop und seine Anwendung.

In this publication the author describes the principal microscopic characters of a number of common and destructive diseases, among them the bacterial rot of potatoes, the bacterial disease of cherries, club root of Cruciferæ, the Phytophthora disease of potatoes, grape mildew, leaf spot of clover, cereal mildews, smuts and rusts of grain, etc. In addition notes are given on a number of insects that cause diseases of plants, such as nematodes, plant lice, scale insects, etc.

Two little known Myxosporiums, C. W. Edgerton (*Ann. Mycol., 6 (1908), No. 1, pp. 48–53, figs. 2*).—During a study of fungi which have a Gloeosporium-like fructification, the author noted two parasites which should be placed in the genus Myxosporium. One of these occurs on the branches of the tulip tree (*Liriodendron tulipifera*), while the other is found on the living branches of apple and pear trees. The latter produces a canker on the old bark and has been frequently confused with another fungus, *Sphæropsis malorum*.

After a careful study of the bark canker and that caused by the black rot fungus, the author concludes that the two forms may be readily distinguished. The bark canker is produced, as indicated above, by a species of Myxosporium, and the name *M. corticolum* n. sp. is given it. The fungus is perennial, living from year to year in the bark, and forming a new ring of growth each year. It grows rapidly in the direction of the main axis, causing the formation of a long narrow canker. It does not penetrate deeply into the host, the mycelium extending only about one-third to the cambium zone. The outer portion of the cortex is killed and dries out much faster than the healthier tissues, and, as a result, this area becomes slightly sunken. During the second year the fungus grows out into the unaffected bark surrounding the canker and this region becomes the spore-bearing one for that season.

Notes are given on the relation of this fungus to others, with a discussion of its synonymy, and a technical description concludes the study of this species.

The second species, which attacks the tulip tree in a somewhat similar manner, is also due to a new species, *M. longisporum*, which is technically described.

Investigations on diseases of cereals in 1908, K. Störmer (*Landw. Wchnschr. Sachsen, 10 (1908), Nos. 35, pp. 306–309; 38, pp. 331, 332; 39, pp. 340, 341; 40, pp. 347–349*).—A report is given of studies carried on at the plant pathology station on the occurrence of cereal diseases in Saxony in 1908. The most important diseases were the smuts of barley and wheat (*Ustilago hordei* and *U. tritici*), the stinking smut (*Tilletia caries*), the stem disease due to *Ophiobolus herpotrichus*, and the leaf and stem disease caused by *Helminthosporium gramineum*.

Different treatments for the prevention of these diseases were tested. The modified hot-water treatment for smut prevention as well as the treatment by means of dry hot air recommended by Kühle (E. S. R., 20, p. 947), which consists of a preliminary soaking of the seed in cold water for several hours, followed by drying in a drying machine heated to 60° C. or more, are recommended as the most efficient treatments for smut.

Notes are given on other diseases, among them rust, mildew, etc.

Formalin for oat smut. A. Goss (*Indiana Sta. Rpt. 1908, pp. 17, 18*).—Attention is called to the value of formalin for treatment of seed oats for the prevention of smut.

The rust of timothy. F. D. Kern (*Torreya, 9 (1909), No. 1, pp. 3–5*).—The occurrence of rust on timothy is said to have been reported in this country as early as 1881 or 1882, but it is only in recent years that it has been found in sufficient abundance to attract attention. In 1906 timothy rust was found fairly abundant in several localities in New York and in 1907 it was also reported from Delaware, West Virginia, and Canada. In 1908 it was also reported from Michigan and Wisconsin.

A study of the rust indicates that it is a physiological species of the common *Puccinia graminis* or *P. poculiformis*, as the author considers the species, and it is believed that there is little danger of the rust transferring to timothy from other cereals and grasses. It is thought probable that the disease will become more general in its distribution and may locally do considerable injury, but in spreading it will be limited to passing the summer spore stages on timothy alone.

The browning of the bracts of hops due to lime nitrogen. Wagner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 6 (1908), No. 11, pp. 126–129*).—A description is given of a browning of the bracts of hop strobiles following fertilizer experiments with lime nitrogen that has caused considerable injury. The injury was observed to be confined almost wholly to plants grown in light soils that had received applications of lime nitrogen in the spring of the year. Autumn applications were followed with no injury, and the author advises the use of this fertilizer in autumn only. The quality of spring fertilized hops was a little better than where the application was made in the fall of the year, but the risk from the browning is believed to be too great to warrant the use of the fertilizer in the spring. The cause of the unfavorable action when applied in the spring is to be investigated.

Varieties of potato scab (*Jour. Bd. Agr. [London], 15 (1909), No. 10, pp. 749–751, pls. 2*).—Descriptions are given of various forms of scab occurring on potatoes, among them the scab due to mechanical injury, the wart disease or black scab caused by *Chrysophlyctis endobiotica*, the scab caused by millipeles or false wireworms, the Oospora scab of potatoes, and the form of scab caused by *Spongospora scabies*.

Dry scab of potatoes. G. Massee (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1909, No. 1, pp. 16–18, fig. 1*).—A description is given of the dry scab of potatoes, due to *Spondylocladium atrovirens*. The injury is confined to the tubers, and no indication of its presence is suggested by the foliage, which remains unaffected. The fungus causes disfigurement of the tuber, followed by local areas of a dry rot. The presence of the fungus is revealed by the occurrence of blackish-olive patches, which soon become depressed below the general surface of the tuber, due to the drying and breaking up of the tissues. Frequently only one or two areas are present on a tuber, varying from half an inch to an inch in diameter.

As the mycelium penetrates a considerable portion of the tuber, it is recommended that tubers showing signs of disease should not be used for planting, even if the portion obviously infected has been cut away.

This disease has been known for a number of years, having previously been attributed to *Phellomyces sclerotiophorus*.

Potato spraying experiments in 1908. F. C. Stewart, G. T. French, and F. A. Sirrine (*New York State Sta. Bul. 311, pp. 38*).—This bulletin gives the results of the seventh year's work in potato spraying in continuation of the experiments begun in 1902. Twenty-seven separate experiments are reported upon.

At Geneva, 6 sprayings with Bordeaux mixture resulted in an increased yield of 39 bu. per acre, while 3 sprayings gave an increase of 29.5 bu., although both early and late blight were wholly absent and there were but few flea beetles. The chief trouble in 1908 was tip burn. There was no rot observed. At Riverhead the gain due to 5 sprayings was 15.3 bu. per acre and to 3 sprayings 10.75 bu.

In the farmers' business experiments, including 200 acres, the average gain due to spraying was 18.5 bu. per acre, with a net profit of $8.53. In 5 of the experiments, spraying was unprofitable.

Eleven volunteer experimenters reported gains averaging 66.3 bu. per acre.

Potato spraying in dry seasons, F. H. Hall (*New York State Sta. Buls. 307, 311, popular ed., pp. 10*).—This is a popular edition of Bulletin 307 of the station previously noted (E. S. R., 20, p. 948) and of Bulletin 311, noted above.

Treatment for scab and early blight on potatoes and mildew on cucumbers and cantaloups, T. C. Johnson (*Virginia Truck Sta. Circ. 1, pp. 2–8*).—The corrosive sublimate and formalin methods of treating seed potatoes for scab, and the use of Bordeaux mixture for preventing the early blight of potatoes and for spraying cantaloups and cucumbers for the prevention of mildew are described.

[Spraying experiments with cantaloups], J. Troop and C. G. Woodbury (*Indiana Sta. Rpt. 1908, pp. 35–37*).—The results of spraying cantaloups with a 5:5:50 Bordeaux mixture for the prevention of rust are given. In these experiments 3.54 acres of cantaloups received 5 applications of the fungicide, the first being made about the time the rust spots began to appear, which was a few days subsequent to the setting of the fruit. The other applications followed at intervals of 1 to 2 weeks. As a result of the spraying, a net profit of $11.49 per acre was obtained.

Melon wilt, J. Troop and C. G. Woodbury (*Indiana Sta. Rpt. 1908, pp. 30, 31*).—An account is given of an attempt to discover the means by which the bacterial wilt of cucurbits (*Bacillus tracheiphilus*) is carried from plant to plant. Forty hills of cantaloups were grown in pots sunken in the ground. The soil for half of the pots was sterilized, while in the others it was unsterilized, and half of the hills of both sterilized and unsterilized soil were covered with screens.

From the results of the experiments, it seems probable that soil sterilization had but little effect and that the disease is largely spread by insects.

The gooseberry mildew, J. Eriksson (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 6 (1908), No. 11, pp. 121–126*).—An account is given of the introduction and distribution of the gooseberry mildew (*Sphærotheca mors-uvæ*) into Europe and attention called to its destructiveness, the various host plants, the time and periods of infestation, and the results of spraying experiments. The author suggests the cutting out and burning of all diseased plants, so far as possible.

Exosmosis in the roots of plants and combating chlorosis, G. Truffaut (*Jour. Soc. Nat. Hort. France, 4. ser., 9 (1908), Dec., pp. 709–713*).—By means of hyacinth bulbs the author has been able to demonstrate the exosmosis of the sulphates of iron, potash, and magnesia placed in cavities of the bulbs. The sulphuric acid found its way into the distilled water in which the bulbs were grown through the roots developed by the plants. Acting upon this suggestion some fruit trees suffering with chlorosis due to an excess of lime were bored into and sulphate of iron placed within the trunks. The sulphuric acid in the iron compound was found to attack the lime deposits within the trees and apparently to permit the absorption of other elements needed by the plant.

Apple blotch, a serious disease of southern orchards, W. M. Scott and J. B. Rorer (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 144, pp. 28, pls. 6*).—As a

result of demonstration experiments conducted in the Middle West in 1906, the authors determined that apple blotch was far more destructive than apple scab and bitter rot combined, and their attention was turned to an investigation of the disease.

This disease is well distributed over the eastern half of the United States, occurring in some regions to such an extent that fully 50 per cent of the fruit is rendered unfit for packing.

The disease, which is of a fungus origin, was first described as occurring on the fruit in a bulletin of the Illinois Station (E. S. R., 13, p. 1059) and later its occurrence was noted by a number of investigators. In 1907 the authors pointed out the relation between certain cankers and leaf spots to the blotch on the fruit. About the same time similar observations were reported by Sheldon (E. S. R., 19, p. 348), who identified the fungus as *Phyllosticta solitaria*.

Apple blotch occurs on the fruit, branches, and leaves, the form on the fruit being by far the most important from an economic standpoint. On the fruit, the first evidence of the disease is shown in small, inconspicuous, light brown blotches, which spread rapidly with an irregular, jagged, advancing margin. Where the spots are numerous they often coalesce and form large blotches, which may cover half the apple or more. The fungus kills only the superficial cells, so that continued growth results in the cracking of the fruits.

Characteristic cankers are formed by the fungus on fruit spurs, twigs, and rapidly growing shoots. At first these cankers are rather small and inconspicuous, appearing as small purple or black blotches. As they increase in size they become brown in the center, retaining a purple margin, but may finally become gray. The bark soon cracks around the cankers, especially along the lateral edges.

On the leaves the spots are irregular, light brown, yellowish, or whitish, small, and are of comparatively minor importance.

The fungus is believed to pass the winter in the twig cankers, these furnishing the chief source of infection. As in the case of other fungus diseases, the apple blotch is dependent more or less upon weather conditions, although it develops in cool as well as in warm weather.

A wide range in susceptibility of different varieties of apples to this disease is noted. An account of the life history of the fungus, a description of its cultural characters, and the results of inoculation experiments are given.

It was shown in 1906 that spraying with Bordeaux mixture was successful in preventing the disease, and in 1907 the experiments were repeated to determine the number and times of application. In most of the experiments a 5:5:50 Bordeaux mixture was employed, but it is thought that probably a weaker solution or one containing a greater amount of lime might be advantageously employed. For the prevention of codling moth and other insect injuries, the addition of 2 lbs. of arsenate of lead or 6 oz. of Paris green is recommended.

The principal period of infection comes usually from 4 to 6 weeks after the petals have fallen, and 4 applications of Bordeaux mixture, the first 3 or 4 weeks after the petals have fallen, will ordinarily be found sufficient. By combining the treatments for insect enemies, bitter rot, blotch, leaf spot and scab, 6 applications, the first when the cluster buds are beginning to show conspicuously and the last about the first of August, would be found advantageous for the control of all of the more important apple troubles.

Scaly bark of citrus, H. S. Fawcett (*Florida Sta. Bul. 98, pp. 75–80, figs. 3*).—This is a preliminary report of investigations on scaly bark, which has been

found quite destructive to sweet orange trees in one of the most important citrus-growing sections of Florida.

The disease is primarily one of bark and rind, the wood being affected only secondarily. The bark of the trunk and of branches of all sizes may be affected, but the greatest injury is done to the younger branches and twigs up to about ½ in. in diameter and to the fruit. On the branches and twigs, more or less circular spots ⅛ in. or more in diameter are developed, the bark becomes brittle, cracks, and forms small flakes or scales. This may continue for several years until the branch is finally girdled and killed. The formation of rough scaly bark also occurs on the trunks of the badly diseased trees, and the exudation of gum is usually an accompaniment of the trouble.

The disease is apparently infectious, and it is believed that it may be spread from tree to tree and from grove to grove.

Studies in the laboratory and field have so far failed to reveal any organism within the diseased tissue, except *Colletotrichum glœosporioides*, the fungus which causes the wither tip.

Experiments have been carried on for the control of the disease, and the author recommends top-working affected trees, heading back, pruning out, and thorough spraying with Bordeaux mixture.

Fungus diseases of cacao and sanitation of cacao orchards, F. A. Stockdale (*Imp. Dept. Agr. West Indies Pamphlet 54, 1908, pp. 47*).—In this pamphlet brief descriptions are given of the principal diseases of cacao and of the remedial measures that have proved to be most successful in dealing with these diseases. It appears that the fungus diseases of cacao are quite amenable to treatment, and as the recommendations are simple and practical in character, there should be no difficulty in carrying them out.

Among the diseases described are the root disease, canker, die back, Lasiodiplodia, thread blight, witches' broom disease, brown rot of pods, and black rot of pods.

The publication concludes with suggestions for the proper sanitation of cacao orchards.

Bud rot of the coconut, E. B. Copeland (*Philippine Agr. Rev.* [*English Ed.*], *1 (1908), No. 5, pp. 210–220, pl. 1*).—An account is given of investigations by the author on the occurrence of the bud rot of the coconut in the Philippines. The disease is reported to be very prevalent in 3 districts and present but doing less damage in several others. The disease is described, and, as a tree once affected is practically valueless, the author recommends that in order to prevent the spread of the disease to other trees all those infected should be burned. A synopsis is given of reports on the occurrence of bud rot in other countries.

The blue rot of coniferous timber, E. Münch (*Naturw. Ztschr. Forst u. Landw., 5 (1907), No. 11, pp. 531–573, figs. 28; 6 (1908), Nos. 1, pp. 32–47, figs. 3; 6, pp. 297–333, figs. 2*).—A study was made of the cause of the so-called blue rot of the wood of various species of coniferous trees and the effect produced by the fungus on the tensile strength of infected timber.

The author found the trouble to be due principally to what has been called *Ceratostomella pilifera*, but instead of there being a definite species under that name, it is really a group of allied forms, which have been separated and studied in detail. Three forms are recognized as new species, *C. piceæ*, *C. cana*, and *C. cærulea*. The first two species are associated with certain species of Graphium in their life cycles.

In addition to the foregoing fungi, the author found *Endoconidiophora cærulea*, a new genus of fungus, attacking pine, fir, and hemlock trees.

The most injury is said to be due to attacks of *C. pini* and *C. cærulea*. The mycelium of the fungi was found to be able to attack and destroy the living tissues of conifers, growing much more rapidly in moist than in dry timber. The specific gravity and strength of timber was found to be decidedly reduced, due to the presence of the fungus.

A fir disease in Saxony, F. W. Neger (*Tharand. Forstl. Jahrb., 58 (1908), No. 2, pp. 201–225, pls. 3, figs. 2*).—For a number of years the fir trees of Saxony and other parts of Germany have been subject to a disease which the author was commissioned in 1905 to study and report upon.

The disease is manifested upon the trees in the thinning of the leaves and the dying of the branches, the top of the tree being usually first to show the trouble, and by a water-soaked appearance of the heart wood. An investigation showed that the disease was due to *Agaricus mellcus* attacking the trees through their taproots. No parasite of any kind was found on the leaves or in the injured twigs. The mycelium of the mushroom forms a dense network of rhizomorphs about the taproot and later enters the tissues, finally causing a rotting of the roots. Later the horizontal roots are invaded and the tree dies.

The attack of the fungus is favored by anything that weakens the vitality of the tree, such as smelter fumes, checking the transpiration stream, resulting in a water-logged condition of the stem and main roots, lack of light, etc. Correcting these conditions will to a great degree diminish the spread and injury due to the parasite.

The white-pine blight in Maine, W. J. Morse (*Rpt. Forest Comr. Maine, 7 (1907–8), pp. 20–25, pl. 1*).—On account of the recent interest in the blight of white pine, the author was led to investigate during the past summer the injury to white pine in a number of localities in Maine. He found that there is no connection between the so-called white-pine blight and that recently described in a pamphlet of the Forest Service of this Department (E. S. R., 20, p. 549). Practically all of the so-called pine blight in Maine in 1907 and 1908 is believed to have been due to adverse weather conditions during the past two winters.

The infectious chlorosis of the Japanese euonymus, E. Baur (*Ber. Deut. Bot. Gesell., 26a (1908), No. 9, pp. 711–713*).—In continuation of previous experiments (E. S. R., 18, p. 648), the author has made a study of the chlorotic forms of the Japanese euonymus and of variegated forms of privet. In some cases he has been able to transfer the infection by means of inoculation experiments, while in others he failed. On this account he is led to the conclusion that there may be an infectious and a noninfectious form of chlorosis. In a previous report he stated his belief that the infectious virus could be isolated, but thus far he has failed to do so.

The destruction of wood by fungi, A. H. R. Buller (*Sci. Prog. Twentieth Cent., 3 (1909), No. 11, pp. 361–378, figs. 3*).—A discussion is given of the destruction of wood by fungi and attention called to a number of the more common species of fungi that attack structural timber, decaying trees, etc.

North American rose rusts, J. C. Arthur (*Torreya, 9 (1909), No. 2, pp. 21–28, figs. 3*).—According to the author practically all rose rusts in North America have been hitherto placed under two species, *Phragmidium speciosum* and *P. subcorticium*. Subsequent studies, however, have shown that there are a number of distinct species, and 6 are recognized, all of which are indigenous but one. The distribution of these species throughout the United States is indicated. The species recognized are *P. americanum*, *P. rosæ-setigeræ*, *P. rosæ-californicæ*, *P. rosæ-arkansanæ*, *P. montivagum*, and *P. disciflorum*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Spring practice in economic zoology, H. A. Gossard (*Ohio Sta. Bul. 198, pp. 15–88+VIII, figs. 10*).—This is the second of a series of manuals of economic zoology to be issued in 4 numbers corresponding with the seasons of the year. The winter number has been previously noted (E. S. R., 17, p. 675).

Under farm management the rotation of crops, fertilizers, and clean farming are discussed. Under natural friends and enemies domesticated animals, rats, mice, rabbits, moles, shrews, skunks, woodchucks, toads, and various species of birds, and methods of attraction or destruction, as the case may be, are briefly considered. The insects attacking grasses, grains, and fruits are described and methods of treatment discussed. Similar data for the insects of the vegetable garden are presented in tabular form. Records of bird migration made at Wooster by S. Harry and A. I. Good are appended.

Eighth report of the State entomologist, 1908, W. E. Britton (*Connecticut State Sta. Rpt. 1907–8, pt. II, pp. VIII+763–848, pls. 18, figs. 12*).—A résumé of the entomological features for 1908 and a report of the nursery inspection work are first presented. In the report of the progress in suppressing the gipsy moth in Connecticut it is stated that the actual size of the area infested by the pest has been considerably reduced during the year. The spring and the fall cankerworms which were more abundant than in 1907 are considered at some length. The San José scale did not spread as much as usual due to the preceding severe winter. From further tests of gases for the destruction of this pest on nursery stock, in which carbon disulphid, carbon tetrachlorid, and acetylene were used, it is concluded that hydrocyanic-acid gas is to be preferred.

A report of an investigation of the mosquito breeding problem at the State Rifle Range at East Haven, and of the Beaver Swamp region, near New Haven, is presented in which it is concluded that for a few thousand dollars the entire region could be put in a salutary condition. Notes are also given on mosquito breeding places in the vicinity of Stamford.

Under insects attacking cucurbitaceous plants in Connecticut the squash borer, striped cucumber beetle (*Diabrotica vittata*), corn root-worm, squash lady-beetle (*Epilachna borealis*), squash bug, melon aphis, squash aphis (*Nectarophora cucurbitæ*), and greenhouse whitefly are considered. The elm-leaf beetle is said to have been the source of more injury to elm trees than for several years. The fungus *Sporotrichum globuliferum* (*entomophilum*) which attacks the pupæ and adults in late summer is one of the most important of its natural enemies. The green clover worm (*Plathypena scabra*) was the source of injury in June and July to bush and pole beans. In experiments made to determine the value of various substances and devices in the prevention of injury to cabbages by the cabbage maggot, the best results were obtained from the use of tarred paper disks. Tests of homemade soluble oil has led the author to advise orchardists to purchase a prepared mixture.

Under insect notes the author reports the snow-white linden moth to have been very abundant in July. The hickory tussock caterpillar (*Halisidota caryæ*) which was abundant during the summer was killed in large numbers in September and October by a fungus disease. Caterpillars of *H. tessellaris* and probably *Estigmene acræa* were also killed by this or a similar disease. Lead arsenate was found to give better results than Paris green when used against the potato beetle. The three-lined leaf-beetle (*Lema trilineata*) which was more than usually abundant on potatoes was fed upon by the predaceous beetles *Lebia grandis* and *Pterostichus lucublandus*. The marsh golden-rod was eaten up in one or more localities by the beetles *Trirhabda canadensis* and *Microrophala vittata*. The chrysomelid beetle *Nodonota puncticollis* was destruc-

tive to young chestnut trees at Stamford. The New York weevil (*Ithycerus noveboracensis*) injured young pear trees in one locality by eating out the base of the new growth. Other insects noted as a source of injury are *Otiorhynchus sulcatus* by eating the leaves of palms, lemon trees, etc., the strawberry weevil (*Anthonomus signatus*), the raspberry sawfly (*Monophadnoides rubi*), apple leaf-folder (*Ancylus nubeculana*), the leopard moth (*Zeuzera pyrina*), the boll worm, and the pyramid caterpillar (*Pyrophila pyramidoides*).

Insect notes for 1908, Edith M. Patch (*Maine Sta. Bul. 162, pp. 351–368, pls. 9*).—This bulletin contains brief accounts of the more important insects of the year 1908.

Nymphs of a predaceous bug, probably *Podisus modestus*, are reported as occurring in the nests and feeding upon young brown-tail moth caterpillars. The greatest amount of damage caused by any single species was due to *Heterocampa guttivitta*. Associated with *H. guttivitta* were the rosy-striped oak-worm (*Anisota virginiensis* [*pellucida*]) and the green-striped maple-worm (*A.* [*Dryocampa*] *rubicunda*), the former particularly on oak and the latter upon maple. The white tipped moth (*Symmerista* [*Edema*] *albifrons*) was very prominent on oak, birch, and other trees. *Argyroploce abietana* injured spruce in one locality by eating out the inside of the leaves. *Acrobasis* (*Phycis*) *rubrifasciella* was injurious to sweet fern and white birch. *Galium verum* was found to be a much preferred food plant of *Deilephila galli* which also feeds upon fireweed, strawberry leaves, etc. *Datana major* was numerous upon deerberry, while gall mites (*Eriophyes fraxiniphila* and *E. fraxini*) are said to have attacked red ash in the vicinity of Orono. Other insects reported include the bean worm (*Ogdoconta cinereola*), *Alcothoe caudata* on the blossoms of Virgin's bower, *Estigmene acræa*, *Diacrisia* (*Spilosoma*) *virginica*, *Basilona imperialis*, the pine hawk moth (*Lapara bombycoides*), *Dibolia borealis*, the raspberry cane borer (*Oberea bimaculata*), *Osmoderma scabra*, *Dermestes vulpinus* in tankage and curd from dried buttermilk, *Corticaria ferruginea*, *Brachys aerosa*, *Dendroctonus terebrans*, *Monohammus titillator* and *M. scutellatus*, *Cryptorhynchus lapathi*, *Conotrachelus nenuphar*, *Aphrophora parallela*, *Eriopeltis festucæ*, *Leptoterna dolobrata*, *Canthophorus cinctus*, *Anasa tristis*, *Lygus pratensis*, *Nematus erichsonii*, *Lophyrus abietis*, plant lice and several species of grasshoppers. *Tiphia inornata*, a parasite upon the white grub, was very numerous.

The apple leaf-hopper and other injurious insects of 1907 and 1908, F. L. Washburn (*Minnesota Sta. Bul. 112, pp. 145–254, pl. 1, figs. 67*).—Studies made of *Empoasca mali* have shown it to be at least two-brooded in Minnesota. The eggs of the summer brood are deposited in the petiole of the clover, apple, and probably other plants. There are said to be 5 nymphal stages, a period of 22 days elapsing after hatching before the adults appear. Adults live 14 days or longer. The presence of the winter egg is denoted by a blister-like swelling on the bark of the apple. The pest does not seriously injure orchard trees but retards the growth of nursery stock and also occurs on a large number of other plants, including alfalfa. It appears desirable that nursery stock be grown at some distance from the apple orchard. The best results as regards remedial measures have been obtained from the use of screens smeared with tangle-foot. Fish-oil soap 1 lb. to 10 gal. of water was found to kill adults and young if they were not too well protected by the curled leaves. Among the destructive shade-tree pests briefly considered are the oak primer (*Elaphidion villosum*), Ægeriid ash borer (*Podosesia* [*Ægeria*] *fraxini*), stalk borer (*Papaipema furcata*), locust borer (*Cyllene robiniæ*), box elder maple borer, bronze birch borer (*Agrilus anxius*), white pine louse (*Chermes pinicortis*), alder aphis (*Pemphigus tesselatus*), cottony maple scale, fall webworm, poplar leaf

beetle (*Melasoma scripta*), Curtis scale (*Aspidiotus ostreæformis*), scurfy scale, white-marked tussock moth (*Hemerocampa leucostigma*), forest tent caterpillar, *Cimbex americana*, *Euvanessa antiopa*, and the elm-leaf beetle.

Further experiments conducted in 1907 with remedies for the cabbage maggot are reported. The best results were obtained by treating cauliflower with a decoction of white hellebore prepared by steeping 2 oz. of the powder for an hour in 1 qt. of water and then diluting with water to make 1 gal. This was applied with a watering pot (from which the rose had been removed) a few days after the plants were set out, with a second application 5 days later, followed by a third 5 days after the second. Holland cabbage appears to be exempt from attack but red cabbage is not. Cabbage maggots were found to emerge from pupæ which were buried 5 in. deep in the soil. *Pseudocucoila gillettei* was the most common parasite that emerged from the puparia, other parasites, including *Homotropus bicapillaris albopictus*, *Aphæreta pegomyiæ*, and *Megaspilus striatipes*.

From the results obtained with the work with the pest during 1908 and previous years it is concluded that "radishes grown in the open are apparently benefited by several applications of hellebore decoction (4 oz. of white hellebore steeped in 2 gal. of water) applied with a watering pot, first when plants are 1.5 in. high, and 3 or 4 later applications at 5 days' intervals; or by the use of tobacco dust with equal frequency in the same way."

Spraying experiments for pests of the orchard and garden are reported and discussed. "Spraying plum trees with arsenate of lead and Bordeaux mixture (3:4:50) two or three times at beginning of curculio season, at intervals of a week or ten days will prevent at least 50 per cent loss of fruit from curculio injury, to which must be added whatever injury from fungi is saved by the use of Bordeaux mixture."

Attention is called to the occurrence of crown gall on raspberries and that such comes under the Minnesota law relating to contagious diseases of plants. The irritating harvest mite or jigger is described and preventive remedies suggested. White grubs (*Lachnosterna rugosa* and *L. fusca*) are said to have been more destructive to lawns in the State in 1908 than ever before. The bee moth (*Galleria mellonella*) is now under investigation. Foul brood is described and remedies briefly considered.

Reports of orchard inspectors (*Zool. Bul. Penn. Dept. Agr., 6 (1908), Nos. 8, pp. 271–300; 9, pp. 303–332*).—A report by counties of the orchard inspection work.

A European ant (Myrmica levinodis) introduced into Massachusetts, W. M. Wheeler (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 337–339*).—The author reports the discovery of *M. levinodis* at Forest Hills and Jamaica Plain, Mass. This species and the variety previously described as *brucsi* with *Tetramorium cespitum* are the only species known to have been introduced into this country from Europe. As *M. levinodis* is very fond of attending aphids and prefers to nest in cultivated soil, it is suggested that it may become of economic importance.

Notes on Tenthredinoidea, with descriptions of new species, I, S. A. Rohwer (*Canad. Ent., 40 (1908), No. 6, pp. 175–180*).—A first paper in which 6 species from Colorado representing the genera Enura, Cephaleia, Emphytus, Hoplocampa, and Lycasta are described as new to science.

A list of parasites known to attack American Rhynchophora, W. D. Pierce (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 380–396*).—This list contains important data that have been recorded since the preliminary list was published (E. S. R., 19, p. 757). The sources of the records are indicated and a bibliography is appended.

Notes on the life history of Nonagria oblonga, W. R. WALTON (*Ent. News, 19 (1908), No. 7, pp. 295–299, pl. 1*).—Infestation by this moth in 75 per cent of the stalks of the common cat-tail rush (*Typha* sp.) is reported as having been found near Harrisburg, Pa. The tachinid (*Masicera myoidæa*) has been reared from the larvæ.

A bit of contemporary history, ANNIE T. SLOSSON (*Canad. Ent., 40 (1908), No. 7, pp. 213–219, pl. 1, figs. 3*).—A description is given of *Ignotus anigmaticus*. This species has been recognized as a pest among the collections of the public museum in Milwaukee, Wis.

Miscellaneous papers. Biological studies on three species of Aphididæ, J. J. DAVIS (*U. S. Dept. Agr., Bur. Ent. Bul. 12, tech. ser., pt. 8, pp. 123–168, figs. 4*).—The author here reports studies made of the biology of the corn root-aphis, corn leaf-aphis (*Aphis maidis*), and sorghum aphis (*Sipha [Chaitophorus] flava*). Technical descriptions are given of the different forms in their various stages and a complete bibliography of each species is appended.

Notes and descriptions of some orchard plant lice of the family Aphididæ, C. P. GILLETTE (*Jour. Econ. Ent., 1 (1908), Nos. 5, pp. 302–310, pls. 2; 6, pp. 359–369, pls. 2*).—In this paper, which is supplemental to Bulletin 133 of the Colorado Station previously noted (E. S. R., 20, p. 854), the author describes the various stages and habits of *Schizoneura lanigera, Aphis pomi, A. persicæ-niger, A. bakeri, Myzus persicæ*, and *M. cerasi*. *Hippodamia convergens* is said to be the most abundant destroyer of the woolly aphis in Colorado. Various other lady beetles are mentioned as feeding upon, and *Aphelinus mali* as having been observed ovipositing in, the woolly aphis.

The army worm at Durham, North Carolina, Z. P. METCALF (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 354, 355*).—The author reports the occurrence of *Heliophila unipuncta* in August, 1908. In order to determine the percentage of infestation by tachinid flies (*Winthemia quadripustulata*), 491 larvæ were collected and observed. Of these 442, or 90 per cent, were infested with eggs of the parasite. Only 7 adult moths emerged, showing a total mortality of 98.6 per cent. The 442 infested larvæ yielded 709 parasitic puparia from which 556 adult flies emerged.

Experiments for the control of the red spider in Florida (Tetranychus bimaculatus), H. M. RUSSELL (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 377–380*).—The red spider was the source of considerable injury to truck, general crops, and citrus trees in Florida during the spring of 1908. Experiments made with lime sulphur, lye sulphur, sulphur, and kerosene emulsion, here reported, show that the pest can be controlled by spraying with any one of the four insecticides.

Notes on the grass mite, Pediculopsis graminum, H. E. HODGKISS (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 375–377*).—A brief account of the distribution of this mite and the injury which it produces. The condition known in grass as "silver top" is said to be the result of the attack upon the stem by this pest. A parasitic fungus (*Sporotrichum poæ*) is said to gain entrance into the stems of grass and buds of carnations with or following the entrance of this mite.

Dimples in apples from oviposition of Lygus pratensis, E. P. TAYLOR (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 370–375, pls. 2*).—The author has found that an injury to apples resembling that of the plum and apple curculio is due to egg punctures made in the very early development of the apple by the common tarnished plant bug. Many peach blossoms were also observed late in March which had apparently been blasted as a result of their having been fed upon by this insect. Out of 110 apples picked from Blue Pearmain trees on April 10, 45, or 40 per cent bore egg punctures. No freshly laid eggs were found after the apples were more than one-third of an inch in diameter. The eggs were

found to hatch in about 8 days. The author has been unable to find any previous report of the deposition of eggs in fruit by this insect.

Crocigrapha normani, EDITH M. PATCH (*Ent. News, 19 (1908), No. 7, pp. 321, 322, pl. 1*).—Notes are given on the life history of this noctuid. Eggs were taken from a leaf of the wild cherry. The larvæ were found to feed readily upon leaves and the small green fruit of the apple.

The tussock moth in orchards, W. J. SCHOENE (*New York State Sta. Bul. 312, pp. 39–49, pls. 3*).—The white-marked tussock-moth (*Hemerocampa leucostigma*) is said to have appeared in destructive numbers in the vicinity of Lockport, New York, during the summer of 1908. A description is presented of the biology of the pest. Cocoons collected or examined at Lockport were found infested by the hymenopterous parasites *Pimpla inquisitor* and *P. conquisitor* and by tachinid flies (*Tachina clisiocampæ* and *Sisyropa* n. sp.). The insect may be efficiently controlled by collecting and destroying the egg masses and by the use of arsenical sprays.

Orchards injured by tussock moth, F. H. HALL (*New York State Sta. Bul. 312, popular ed., pp. 5, figs. 6*).—A popular edition of the above.

Must the calyx cup be filled? M. V. SLINGERLAND (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 352–354, pl. 1*).—The author made investigations of the feeding habits of young codling moth larvæ to determine whether they feed in the upper calyx cavity after squeezing through between the calyx lobes, or go on down through the closely-set row of stems into the lower calyx cavity for their first meal. It was found that in every case where the young larva had entered the apple at the calyx end it had fed for several days, or through the first larval stage, in the outer calyx cavity.

Proprietary and homemade miscible oils for the control of the San José scale, C. D. JARVIS (*Connecticut Storrs Sta. Bul. 54, pp. 169–197, fig. 1*).—This bulletin supersedes Bulletin 49 of the station previously noted (E. S. R., 19, p. 662). It furnishes additional information in regard to the home manufacture of miscible oil, throws some light on the various commercial soluble oils, and reports the results of experiments with oil spraying in various sections of the State. As compared with lime-sulphur wash miscible oils are found to be more convenient, more pleasant to handle, less destructive on spraying equipment, and more efficient, especially with large apple trees.

"From the results of these experiments it seems safe to conclude that when used at the rate of 1:15, the commercial and homemade miscible oils may be depended upon to control the scale without injury to the tree. Their predominating weakness lies in their failure to leave a mark on the tree. This lack of a mark makes it difficult to determine the thoroughness of the application. It is believed that in most cases of failure to secure good results from oil spraying, the cause may be attributed to the failure of the operator to wet the tree completely with the spray. That miscible oil at the proper strength will kill every scale with which it comes in contact is clearly demonstrated by the experiment in dipping nursery stock. No injury to the tree has been observed in any of the experiments, while, on the contrary, a decided benefit from the fungicidal properties of the various miscible oils has been apparent. . . .

"The most important factor in the home manufacture of miscible oil is the securing of the proper materials for the purpose. As a rule they can not be obtained from the local dealer and must be purchased directly from the producer.

"In view of the difficulty in securing the proper materials and since commercial preparations may now be obtained at a reasonable price, fruit growers are advised not to make up their own miscible oil, unless they require enough

to warrant the purchase of materials in barrel lots directly from the producer. . . .

"Miscible oil may be applied any time during the dormant season, so long as the temperature is above the freezing point."

Miscellaneous treatment for San José scale, T. B. Symons (*Maryland Sta. Bul. 131, pp. 129–149*).—A number of new patent washes including Niagara brand concentrated lime-sulphur, orchard brand lime-sulphur, Rex lime-sulphur, San-u-zay, Target Brand scale emulsion, Orchard Brand soluble oil, and avenarius carbolineum were tested.

From these tests it appears that all the stronger solutions employed with the exception of San-u-zay and avenarius carbolineum gave good results. From further experiments with hydrocyanic-acid gas it was determined that the excessive amount of 0.50 gm. of cyanid per cubic foot will not injure peach buds under ordinary conditions of fumigation. At 0.30 gm. per cubic foot, 30 minutes was not sufficient to kill all the scales and 45 minutes exposure is recommended. Dipping experiments in which dormant nursery trees were dipped in several insecticides including lime-sulphur, Scalecide, Target Brand, soluble oil, Kill-o-scale, and San-u-zay indicate that the treatment is effective in combating San José scale. Further experimentation is considered necessary, however, before such treatment can be recommended.

Notes on Aspidiotus destructor and its chalcid parasite in Tahiti, R. W. Doane (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 341, 342*).—The author visited the Society Islands during the summer of 1908 to study the conditions that control the appearance and disappearance of the transparent coconut scale. In some of the islands this scale has killed many of the trees and affected others so badly that no nuts are borne. The pest attacks all parts of the tree, except the roots and old trunk, and in all stages of its growth.

In Tahiti on most of the plantations the scale was found to be disappearing at a very rapid rate, due to the work of the parasite *Aspidiotiphagus citrinus*. On some of the trees 50 to 75 per cent of the scale were found to be dead. Specimens of the scale more or less badly parasitized from 6 islands of the group were seen by the author, and it is thought that under normal conditions the parasite will soon have the scale so well under control that it will no longer be a menace to the trees.

Care of scale-infested trees, H. A. Surface (*Zool. Bul. Penn. Dept. Agr., 6 (1909), No. 11, pp. 367–396*).—Directions for the care of trees infested with San José and other scales. The angoumois grain moth is also briefly considered.

Whitefly studies in 1908, E. W. Berger (*Florida Sta. Bul. 97, pp. 43–71, figs. 18*).—This is a revision of Bulletin 88 of the station previously noted (E. S. R., 18, p. 850), together with a report of progress.

Six fungus parasites are now known to infect the larvæ of the whitefly and a seventh infects both larvæ and adults. Methods for introducing whitefly fungi are considered at some length. The writer is of the opinion that by following the recommendations here made regarding parasitic fungi that their efficacy can be doubled and a clean fruit produced two years out of three.

Two fungus hyperparasites *Cladosporium* sp. and *Coniothyrium* sp. are reported. The former frequently overruns and destroys red and yellow Aschersonias, while the latter occasionally overruns pustules of the brown fungus, chiefly after the latter has become old or weakened from drought or cold weather.

The food plants preferred by the whitefly include two native species, prickly ash (*Fagara clava-herculis*) and the wild persimmon (*Diospyros virginiana*), and several introduced species, namely, all varieties of citrus, chinaberry, umbrella tree, cape jessamine, privets, and Japanese persimmon. The author

lists 18 additional species of food plants which the whitefly sometimes infests. Chinaberry and umbrella trees are considered as the food plants most to be feared by citrus-growing communities. Investigation has shown that whitefly larvæ and pupæ can continue to live on leaves which have dropped from trees during winter if protected against complete drying up and that these insects may mature sufficiently late in the spring to infest the new leaves. Defoliation is not recommended as a means of checking the whitefly in a grove except when the defoliation has already been in a great measure accomplished by a freeze.

The author has found the citrus whitefly in Florida to consist of two distinct species and here presents a description of the second, a new species to which he has given the name *Aleyrodes nubifera*. The eggs of the new species are reticulated instead of smooth like the eggs of *A. citri*. Distinct differences also exist in the first and fourth larval stages and in the pupæ. The adults of *A. citri* have immaculate wings while those of *A. nubifera* have a smoky colored area near the end of the wing easily visible in the living insect with the aid of a lens.

The saddled prominent (Heterocampa guttivitta), Edith M. Patch (*Maine Sta. Bul. 161, pp. 311–350, pls. 8, fig. 1*).—The author reports *H. guttivitta* to have denuded vast areas of hard wood forests in Maine in 1907 and 1908. Studies made of the life history and habits and descriptions of the several stages are presented, with suggested means of control.

But one generation occurs in Maine. In 1908 moths emerged in greatest numbers in May and early June, oviposition soon commenced and eggs hatched in about 9 days. The larvæ become full grown in about 5 weeks, during which time 4 molts are passed, then enter the ground to pupate. The eggs are said to be deposited singly upon the leaves, the moths apparently preferring to oviposit upon the upper leaves of trees. Beech leaves were the favorite food of the species but other trees and succulent plants were also fed upon.

Pimpla pedatis and *Ichneumon sublatus* were bred from pupæ, the latter species in large numbers. Of the predaceous wasps species of the Ammophilas were particularly abundant. The adults and larvæ of Calosoma were numerous in the infested woodlands, the larvæ being particularly fond of fresh pupæ. *Pterostichus lucublandus* was abundant in the spring of 1907 under beech trees where the pupæ were hibernating. *Podisus modestus* was the most active of the predaceous bugs in feeding upon the caterpillars. Late in July and early in August various species of caterpillars were attacked by a fungus disease and in some instances practically the whole infestation of saddled prominents was wiped out. It is considered probable that *P. modestus* was an important agent in the transfer of the spores of this fungus. A list is given of 53 species of birds that are supposed to feed upon the pest in Maine.

Arsenicals are recommended for use against the pest in fruit orchards. The caterpillars are readily shaken from the branches, which fact has been made use of in some instances, the trees afterward being protected by sticky bands on the trunk.

A new species of the Tortricidæ, C. H. Fernald (*Canad. Ent., 40 (1908), No. 10, pp. 349, 350*).—The species here described (*Argyroploce abictana*) is reported as injuring small spruce trees in Maine.

Work of the Bureau of Entomology against forest insects, A. D. Hopkins (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 343–348*).—A brief account of the investigations made of forest insects in this country.

Tick eradication, E. C. Cotton (*Tennessee Sta. Bul. 81, pp. 53–71, figs. 7*).—The author has conducted an investigation of the cattle tick and here furnishes information regarding its life history and habits and their relation to exterminative measures.

The life cycle is illustrated graphically and shows the time required at Knoxville to starve seed ticks that hatch from eggs laid by the engorged ticks which drop on April 15 and September 15. "After the ticks drop to the ground on April 15, 10 days will elapse before egg laying begins. The ticks will continue November 13, a period of 4 months and 21 days (141 days). . . . For ticks laying until May 28, or 33 days, the eggs will begin hatching on June 25, an incubation period of 60 days, and the seed ticks will not all be dead until dropping from the host animal on September 15, the time elapsing before egg laying will be but 4 days and the tick will cease laying on October 15, an egg-laying period of 26 days. The eggs will not hatch, however, until March 17 of the following spring, or an incubation period of 6 months (180 days), and the seed ticks will not all be dead until July 28, a period of 4 months and 3 days (123 days). . . . Engorged ticks dropping from the host animals during [December, January, and February] will usually freeze to death before laying any eggs."

The author considers pasture rotation as the most effective method of control under general farm conditions, particularly where a rotation of crops is practiced. Examples of two rotation systems requiring 4 and 5 years are given as applicable to tick eradication. The feed-lot method is also explained. For those sections of Tennessee where the pasture rotation method can not be applied, dipping and oiling are recommended. Life histories and habits of the cattle tick and dog tick are compared in diagrammatic and tabular form.

Another chalcidoid parasite of a tick, L. O. Howard (*Canad. Ent., 40 (1908), No. 7, pp. 239–241, fig. 1*).—A second chalcidoid parasite of a tick is here described as *Hunterellus hookeri*. This species has been bred from engorged nymphs of the brown dog tick, *Rhipicephalus texanus*, collected at Corpus Christi, Tex.

Notes on fleas collected on rat and human hosts in San Francisco and elsewhere, R. W. Doane (*Canad. Ent., 40 (1908), No. 8, pp. 303, 304*).—Out of 1,300 fleas collected upon rats (*Mus norvegicus*) in California, *Ceratophyllus fasciatus* was represented by 863 specimens, *Pulex irritans* by 163, *Leemopsylla cheopis* by 139, and *Ctenopsyllus musculi* by 118. Out of 684 fleas collected on man *P. irritans* was represented by 680.

Notes on the hen flea (Xestopsylla gallinacea), G. W. Herrick (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 355–358*).—The author reports observing more than 325 specimens of *X. gallinacea* on a single fowl at Agricultural College, Miss. Engorged females were found to deposit all of their eggs on the day following their placement in vials. An average of 3 eggs were deposited by 15 fleas thus isolated, 7 being the maximum number deposited. The eggs were found to hatch within 48 hours after deposition.

The foul brood of bees and the foul-brood law, G. W. Herrick and E. E. Scholl (*Texas Sta. Bul. 116, pp. 3–10*).—An account of the American and European foul brood with directions for treatment, to which is appended the Texas foul-brood law.

Calendar for the treatment of plant diseases and insect pests, W. J. Green, A. D. Selby, and H. A. Gossard (*Ohio Sta. Bul. 199, pp. 89–102*).—This is a revised edition of Bulletin 147 of the station (E. S. R., 16, p. 77). Formulas are given with directions for the use of insecticides and fungicides.

Treatment of plant diseases and injurious insects in South Carolina, H. W. Barre and A. F. Conradi (*South Carolina Sta. Bul. 141, pp. 3–52, fig. 1*).—In this bulletin the authors describe spraying machinery, insecticides, and fungicides, and their use in combating the more important insect enemies and plant diseases of fruit trees, shrubs, vegetables, and field crops.

Washington State College spraying calendar for 1909, R. K. Beattie and A. L. Melander (*Washington Sta. Popular Bul. 13, folio*).—Directions for the preparation and use of several insecticides and fungicides for the treatment of the more important insect fungus enemies of plants are given in calendar form.

Cyanid as an insecticide, R. S. Woglum and W. Wood (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 348–350*).—The authors report that a solution of potassium cyanid at the rate of 1 oz. to a gallon of water when poured into a small pit at the exit of a burrow destroys ants to a depth of 1½ ft. below the surface of the soil. This solution can be prepared at a cost of from 1½ to 2 cts. per gallon. It appears, however, to be injurious to plant life.

Preliminary report on results of analysis of Paris green, F. D. Fuller (*Penn. Dept. Agr. Bul. 166, pp. 6*).—Thirty-six samples of Paris green bought in the open market were analyzed and the results are here reported. These samples represent the product of 36 manufacturing concerns. The amount of arsenic calculated as arsenious oxid varied from 55.24 to 59.47 per cent with an average of 56.82 per cent. The amount of arsenic in water soluble form calculated as arsenious oxid varied from 0.7 to 2.52 per cent with an average of 1.48 per cent.

The economic entomologist in business, H. L. Frost (*Jour. Econ. Ent., 1 (1908), No. 6, pp. 350–352*).—The author calls attention to the great need of commercial economic entomologists. While the business of caring for trees has made tremendous advancement in the last 10 years, there are still many problems to be solved that require the attention of the economic entomologist.

FOODS—HUMAN NUTRITION.

Report upon the chemical examination of drawn and undrawn poultry kept in cold storage, W. F. Boos (*Ann. Rpt. Bd. Health Mass., 39 (1907), pp. 263–283*).—The author summarizes as follows the results of his studies on drawn and undrawn cold storage poultry:

"In cold storage itself no chemical changes occur. This is shown by:

"(a) The absence, after nine months and more of cold storage, in both drawn and undrawn cold storage fowl of ptomaines and decomposition products in general, except such as are formed by bacteria and autolytic changes occurring before the birds are placed in cold storage and after they are thawed.

"(b) The negative results of animal inoculations with extracts obtained from the two kinds of poultry.

"When fowl are taken out of cold storage and exposed to a temperature of 68° F., the conditions of exposure being the same, the undrawn birds show better keeping qualities [than those drawn by the usual method].

"When freshly killed fowl are exposed at 68° F. under conditions constant for all the birds exposed, the birds drawn according to the [improved] method described . . . show perfect keeping qualities, while the undrawn fowl undergo a rapid process of decomposition. Under these conditions the ordinarily drawn birds show fair keeping qualities, although they are not free from bacterial decomposition.

"It may be concluded, therefore, from these results that it is best to draw fowl in a different manner from that usually followed, before they are placed in cold storage. After removal from cold storage, the fowl should never be contaminated by soaking in water, but should thaw in the air. Ordinary drawing is worse by far than no drawing at all."

Report upon the bacteriological examination of drawn and undrawn poultry kept in cold storage, H. R. Brown (*Ann. Rpt. Bd. Health Mass., 39*

(*1907*), *pp. 285–336*).—An extended series of bacteriological investigations of drawn and undrawn cold storage poultry led to the following general conclusions:

"Poultry kept at temperatures ranging from +5° to —14° F. undergoes no decomposition as a result of bacterial activity.

"Freezing destroys the red and some of the white blood corpuscles.

"Freezing temperatures as low as —14° F. destroy a large percentage of the bacteria present, but do not affect the more resistant ones.

"When the tissues are thawed, they become moistened by the melting ice crystals, and in this condition bacterial growth is facilitated and decomposition of the tissues and contents of the cells is promoted.

"In the drawn chickens placed in cold storage aerobic conditions prevailed throughout the pleuro-peritoneal cavities. The undrawn chickens showed much smaller numbers of bacteria in the pleuro-peritoneal cavities. On account of the closed cavity, partial anaerobic conditions prevailed in these birds.

"In decomposing meats, putrefactive aerobic bacteria may possibly produce the primary stages and prepare the way for anaerobes which possibly control the intermediate stages of decomposition. By the combined action of both, decay is brought about, but it is probably finished by aerobic bacteria.

"From these facts it appears that, given the aerobic conditions and the larger numbers of bacteria growing on the moist surfaces and tissues of a thawed drawn chicken, decomposition will proceed at a more rapid rate than with an undrawn one containing fewer bacteria existing under partial anaerobic conditions.

"In freshly killed, unfrozen drawn chickens, the surfaces and tissues become dry within a very short time, and, although aerobic conditions prevail, the bacteria can not grow because of lack of moisture.

"In freshly killed, unfrozen and undrawn chickens, on account of the closed pleuro-peritoneal cavities there is no drying of the tissues and surfaces, and facultative aerobic and anaerobic bacteria from the intestines rapidly cause decomposition.

"By the removal of the viscera without the spilling of the contents of the alimentary tract decomposition can be prevented absolutely. The operation requires about two minutes.

"Briefly stated, decomposition depends largely upon the presence of moisture in the tissues, for moisture is absolutely essential to bacterial growth. In freshly killed birds, ordinarily or properly drawn, the surfaces quickly become dry. In cold storage birds, no matter how they are drawn, the tissues will be moist, because of the melting of the crystals of ice. If properly drawn, there would be but few bacteria present capable of causing decomposition."

Cold storage and its relation to food preservation, M. Bureau (*Ann. Soc. Agr. Sci. et Indus. Lyon, 1907, pp. 351–381, figs. 15; 394–396*).—Methods of producing low temperature, the application of such processes to food preservation, and general topics connected with the cold storage industry in France and elsewhere, are considered. The paper is followed by a discussion.

The oyster question (*Mo. Bul. Ind. Bd. Health, 10 (1908), No. 11, pp. 134–136, fig. 1*).—Analyses of shell and solid pack oysters are reported in comparison with similar data obtained with watered and iced stock. On an average the weight of meat in solid pack oysters was 397.4 gm. in a pint as compared with 268.5 gm. in watered oysters.

"It is contended by oyster packers who have been accustomed to shipping iced and watered stock and who wish to continue to do so, that icing does not increase the volume of oysters appreciably if at all. This contention can not be correct, for by comparison the percentage of solids in the meat is in one

instance 17.06 and in the watered stock 13.31, a difference of 22.05 per cent in favor of the solid pack, and while the solid pack contains 26.76 per cent of water in the sample, the watered stock contains 43.50 per cent. The solid pack contains 73.24 per cent of meat and the watered stock 56.50 per cent, here again showing a very decided advantage in favor of the solid pack. The average solid content of the solid pack oysters is 13.40, and of the watered stock 8.59, a difference in favor of the solid pack amounting to 35.9 per cent."

On the basis of the analytical work the question of pecuniary loss to the consumer, legislation, and similar topics are discussed.

Concerning changes in egg pastes when stored, G. Popp (*Ztschr. Öffentl. Chem., 14 (1908), No. 23, pp. 453–463*).—The analytical data reported and discussed have to do with changes in the quality of egg pastes. The author concludes that a knowledge of the composition of the raw materials used in making such goods is absolutely essential for a perfectly trustworthy opinion. When this is known it is possible to estimate the amount of egg per pound with considerable accuracy. The amount used in the noodles is very small, perhaps one-third of one egg per pound. In judging the quality of egg pastes the author considers a complete analysis essential in addition to date regarding cholesterin.

Analysis of gases contained in swollen canned goods, F. O. Tonney and J. B. Gooken (*Amer. Food Jour., 3 (1908), No. 6, pp. 20–23, figs. 3*).—The methods followed in analyzing gases from swollen cans are described. The presence of carbon dioxid together with alcohol in a large number of samples indicates that in many cases the swelling is due to alcoholic fermentation which results from imperfect sterilization of the canned contents. Nitrogen occurred in most of the swollen cans, and its significance, aside from the small amounts due to the entrance of air, lies, the authors believe, in the fact that it may be regarded roughly as an index to the amount of proteid decomposition which has taken place. "In general it may be said that nitrogen indicates putrefaction and carbon dioxid indicates fermentation. The two processes, however, were not often found to be distinct from each other.

"The presence of hydrogen, which was found in quantities varying from 0 to 58 per cent, is believed by the writers to be an especially valuable indication of ptomaine producing processes. . . .

"Marsh gas was occasionally found in small amounts associated with hydrogen. Its significance is probably similar.

"Carbon monoxid, which was found in a few cases, probably owed its presence to the reduction of carbon dioxid by nascent hydrogen.

"Oxygen in negligible traces was thought to be due to the entrance of small amounts of air.

"One of the most noticeable facts brought out in the course of the analyses was the extreme variation in the amount and kind of constituent gases in the same type of goods. One can out of a lot may show simple alcoholic fermentation, while its neighbor in the same box presents marked evidences of putrefaction. It is evident, therefore, that a favorable analysis of one or two cans can not properly be taken as a criterion for the safety of the lot."

The question of the treatment of such goods and of swollen cans and their subsequent sale is considered. "The possibility, or rather the likelihood of danger to a large number of persons, should be sufficient to exclude such products from sale. And in the absence of any unfailing chemical tests for the toxic bodies themselves, the presence of conditions favorable to their formation and the presence of substances commonly associated with them must be considered adequate grounds for condemnation."

The manufacture of preserved meat goods, W. Dosquet (*Die Fabrikation von Fleischkonserven. Brunswick, 1908, pp. 37, figs. 2; reprint from Deut.*

Vrtljschr. Offentl. Gsandhtspflege, 39, No. 4, pt. 2).—A digest of data on the technique of meat canning, with special reference to hygienic requirements, preservation of aroma and quality, in which the author has embodied the results of his experience and investigations.

"Vapor," a preparation for smoking meat, A. Juckenack (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, pp. 731, 732*).—A preparation tested in Germany for smoking meat, sausage, etc., was found to consist of 92 per cent sulphur with oxid of iron and organic material, probably dried juniper berries.

A new preservative for fruit juice, A. Juckenack (*Ztschr. Untersuch. Nahr. u. Genussmtl., (1908), No. 12, pp. 730, 731*).—A new commercial preservative on the market in Germany was found to consist of a mixture of benzoic acid and potassium sodium tartrate.

Contribution to the fruit juice statistics of 1907–8, A. Juckenack (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, pp. 742, 743*).—Analyses of raspberry, cherry, strawberry, and currant juices are reported.

Fruit statistics 1908. H. Lührig, P. Bohrisch and A. Hepner (*Pharm. Centralhalle, 49 (1908), No. 43, pp. 869–873*).—Data are given regarding the examination of a considerable number of samples of raspberry, blackberry, and currant juices.

Supplement to fruit juice statistics for 1908, A. Beihe, F. Grosse, and G. Schmidt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, pp. 734–737*).—Analyses of raspberry juice, blueberry juice, and red bilberry juice are reported.

Note on fruit juice statistics, F. Härtel, P. Hase, and W. Mueller (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, pp. 744, 745*).—Analyses of apricots, raspberries, and raspberry juice are reported.

Note on fruit juice statistics, A. Gronover (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, p. 745*).—Analyses of wild raspberry juice are reported.

The composition of berries with special reference to the alkalinity of the ash, K. Fischer and K. Alpers (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, pp. 738–741*).—Currants, cherries, and berries of different sorts are included in this analytical study.

Examination and judging of lemon juice, E. Frisch (*Arch. Pharm., 246 (1908), Nos. 6, pp. 472–480; 7, pp. 481–484*).—Analytical and other data are reported in this critical study of the analysis and valuation of lemon juice.

Composition of a number of natural wines from southern France, I. Fiehe (*Chem. Ztg., 32 (1908), No. 91, pp. 1105, 1106*).—Analyses of 17 red, white, and half white wines are reported.

Swiss wine statistics for the year 1907 (*Ann. Agr. Suisse, 9 (1908), No. 4, pp. 169–191*).—Results of the examination of Swiss wines are reported.

Food and drug inspection (*Ann. Rpt. Bd. Health Mass., 39 (1907), pp. 337–355*).—A summary of the character and extent of the inspection work of the State board of health for the year ending November 30, 1907.

Report of the analyst, H. C. Lythgoe (*Ann. Rpt. Bd. Health Mass., 39 (1907), pp. 357–386*).—During the year a total of 5,684 samples of milk and other foods and drugs were examined. Of these 1,546 were found to be adulterated and 4,138 were genuine. The report contains the usual data regarding the different groups of products examined.

[State food and dairy commission report] J. Q. Emery (*Semiann. Bul. Dairy and Food Com. Wis., 1907, No. 11–12, pp. 242*).—This volume contains a summary of the State laws, the report of the chemist, results of inspection of

cheese factories and creameries, milk inspection, an account of prosecutions under the law, and similar data.

Chemist's analyses, R. FISCHER (*Semiann. Bul. Dairy and Food Com. Wis., 1907, No. 11–12, pp. 9–103*).—During the year ending December 31, 1907, it is stated that 2,157 samples of food and drugs were analyzed, of which 1,097 were pronounced unlawful by reason of being adulterated or misbranded.

"It should be emphasized that these figures and those given in the appended summary do not by any means represent the true condition of the Wisconsin market. In most instances only such samples were sent to the laboratory for analysis as were suspected of being adulterated. This was particularly true of butter, cheese, cream, milk, oleomargarine and canned goods, where the ratios of unlawful to lawful samples are very much higher than the actual figures. For example, while the actual number of samples of milk collected by our inspectors from creameries and cheese factories was 4,470, only 143 were sent to the laboratory as suspicious. Of these 143 samples, 123, or 2.75 per cent of the total number, were found adulterated. In the case of drugs, however, the figures in most cases show the actual conditions of the Wisconsin market in respect to the kinds of drugs analyzed."

[Report of the dairy, food, and oil commissioner of Wyoming], E. W. BURKE (*Ann. Rpt. Dairy, Food and Oil Comr. Wyo., 4 (1908), pp. 1–34*).—A general account of the work of the Wyoming State Dairy, Food, and Oil Commissioner. Summaries of information on a variety of topics connected with pure food are included, as well as a discussion of conditions in meat markets and slaughterhouses, hotels and restaurants, and dairies. The author recommends that hotels and restaurants should be under the same supervision and by the same authorities as meat markets and slaughterhouses.

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 104, pp. 3; 105, pp. 2; 106, pp. 2*).—These decisions have to do with the amendment to Food Inspection Decisions 76 and 89, relating to the use in foods of benzoate of soda, the labeling of canned salmon and whitefish, and the amendment of Food Inspection Decision 77, particularly with reference to the definition of the terms "batch" and "mixtures."

Food Inspection Decision 104 contains the report of the Referee Board of Consulting Scientific Experts, appointed by the President of the United States, to consider the use of benzoic acid.

"The main general conclusions reached by the Referee Board are as follows:

"First. Sodium benzoate in small doses (under 0.5 gm. per day) mixed with the food is without deleterious or poisonous action and is not injurious to health.

"Second. Sodium benzoate in large doses (up to 4 gm. per day) mixed with the food has not been found to exert any deleterious effect on the general health, nor to act as a poison in the general acceptation of the term. In some directions there were slight modifications in certain physiological processes, the exact significance of which modifications is not known.

"Third. The admixture of sodium benzoate with food in small or large doses has not been found to injuriously affect or impair the quality or nutritive value of such food."

Notices of judgment (*U. S. Dept. Agr., Notices of Judgment 38, pp. 2; 39–42, pp. 7; 43–47, pp. 11; 48–49, pp. 4*).—These notices of judgment have to do with the misbranding of canned corn, corn and beans, canned peas, butter, meal, maple sirup, and coffee, and the adulteration of water and eggs, and the adulteration and misbranding of whisky and vanilla extract.

Food legislation during the year ended June 30, 1908, W. D. BIGELOW and N. A. PARKINSON (*U. S. Department Agr., Bur. Chem. Bul. 121, pp. 85*).—This bulletin is a compilation of the food legislation enacted in the United States

and Canada during the year ended June 30, 1908, and supplements Bulletin 112 of the Bureau previously noted (E. S. R., 19, p. 1163).

Ohio food and drug laws. R. W. DUNLAP (*Columbus, 1908, pp. 41*).—This compilation of Ohio State food and drug laws was prepared by the State dairy and food commissioner.

Regulations under the public health (regulations as to food) act, 1907, S. B. PROVIS (*Local Govt. Bd. [Gt. Brit.] Circ. (Foreign Meat No. 2), pp. 7*).—The regulations which are included have to do with boneless meat and boxed meat, tripe, tongue, and kidneys, and other meat and meat products imported into Great Britain.

Food inspection at ports of entry. W. F. DEARDEN (*Jour. Roy. Sanit. Inst., 29 (1908), No. 11, pp. 681–688*).—The author discusses the provisions of the bill which received royal assent in September, 1908, providing for the inspection by port sanitary authorities of foodstuffs imported into England and Wales.

The importance of pure-food laws for fruit and vegetable products with special reference to nutrition problems. T. ECHTERMEYER (*Sehr. Volksw. Ver. Obst. u. Gemüseverwert. Deut., 1908, No. 4, pp. 16*).—A general discussion of the subject presented at the Eighth International Congress of Agriculture in Vienna, 1907.

The paper is preceded by an introductory statement by J. Kochs.

Essentials of diet in health and disease. AMY E. POPE and MARY L. CARPENTER (*New York, 1908, pp. 250; rev. in Dietet. and Hyg. Gaz., 23 (1909), No. 1, p. 44*).—A discussion of food, digestion, and diet in health and disease, with a number of recipes for the preparation of food for the sick and convalescent. The volume is intended for use in nurses' training schools and in the home.

The baby. D. R. BROWN (*Boston, 1908, pp. VI+200*).—In this general treatise on infants there are chapters on the elements of food and digestion, lactation, substitute foods, and substitute feeding.

Carrot soup for infants. E. MORO (*München. Med. Wchnschr., 55 (1908), No. 31, pp. 1637–1640, figs. 4; abs. in Biochem. Zentbl., 7 (1908), No. 21–22, p. 83*).—Soup made from carrots and beef seasoned with salt caused a rapid retention of water in the body and diminished intestinal flora when fed to sick infants.

Dietary conditions in Java. J. J. MATIGNON and J. SALM (*Rev. Hyg. et Pol. Sanit., 30 (1908), No. 6, pp. 471–484*).—General dietary conditions in Java, the character of the rations of different groups of the native and foreign population, the preparation of food, and related questions are discussed. The data regarding the nutritive value of rations and portions of food digested are given on the authority of Eyckman.

[Food of Dundee mill operatives]. W. A. G. CLARK (*Daily Cons. and Trade Rpts. [U. S.], 1908, No. 3330, pp. 1–8*).—In an article on the Dundee jute industry the author gives considerable data regarding the food supply and cost of food of Dundee factory operatives, housing conditions, and related topics.

[The new army ration, fireless cookers, etc.] (*Rpt. Commis. Gen. [U. S. Army], 1908, pp. 10–13*).—Information is given regarding the new U. S. Army ration, bake ovens and ranges, kitchen cars, army training schools for bakers and cooks, the ration for officers and civilians serving in the field, and related questions.

As regards the use of fireless cookers, the author states that 100 specially constructed cookers have been tested. "They were tried out on the march, on bivouac, and in maneuver camps, and so far as reports have been received have proved highly satisfactory, with the addition of slight changes suggested by actual experience, and which can be readily made. Some criticism has been made on the subject of adopting the fireless cooker, on account of its weight, as a part of the company field outfit.

"These cookers designed by the Subsistence Department combine lightness of weight with stability of construction, and are intended to stand long travel on rough roads and assure the perfection of the contents at the end of the journey. This method of cooking will insure hot meals of excellent quality on the march, on bivouac, or on the firing line, save expense and labor, and largely contribute to the health and comfort of the troops."

The up-to-date home. Money and labor saving appliances, M. Le Bosquet (*Bul. Amer. School Home Econ., Ser. 1., 1908, No. 11, pp. 48, figs. 54*).—Kitchen appliances and labor-saving devices, alcohol as fuel, electric cooking, gas, laundry appliances, and other similar questions are discussed in this summary of data which is based on tests made and information collected by the author.

Experiments with an ash-free diet, H. W. Goodall and E. P. Joslin (*Trans. Assoc. Amer. Physicians, 23 (1908), pp. 92–106*).—The ash-free diet used in the experiments reported consisted of specially prepared egg albumin, olive oil, and sugar. Two healthy individuals were subjects of the experiments, which were continued for periods of 13 and 9 days, respectively.

According to the authors, the results obtained indicate no marked changes in metabolism ascribable to the ash-free diet. The experimental data "simply represent the withdrawal of accessory salts from the body. They confirm the views of earlier writers, that it is practically impossible to diminish the chlorin of the body by more than 10 to 14 per cent, and that the loss is proportionate to this. No remarkable symptoms appeared, and those that occurred were rather less than would be expected from such a diet, even though it contained a normal quantity of salts. We do not feel that they afford a basis for any far-reaching deductions as to changes in metabolism, and they certainly give no support to the view that the withdrawal of salts from the diet will cause an acidosis of the acetone variety."

The paper is followed by a discussion.

The effect of certain food accessories on the activity of digestive juices, K. Togami (*Biochem. Ztschr., 9 (1908), No. 5–6, pp. 453–462*).—The tea infusion used hindered the activity of the salivary and pancreatic enzyms and of pepsin in artificial digestion experiments. Coffee infusion made from ordinary coffee, and that with a low caffein content, did not exercise any effect on these digestive enzyms. Chocolate infusion slightly diminished the digestive power of pepsin. From his results the author draws the general conclusion that when of usual strength the materials studied exercise no harmful effect upon digestive ferments. If, however, the infusions are very strong, the reverse may be the case, as was shown by the tests with tea.

A study of the enzyms of the human pancreatic and intestinal juice obtained through a jejunal fistula, J. H. Hoelscher (*Ther. Gaz., 32 (1908), No. 10, pp. 692–703*).—According to the author the experiments which he reported show that the amylolytic ferment present in the digestive juice studied and which changes maltose into glucose is glucase. "It could be shown that part of the sugar formed in the experiments was glucose; this was due to the presence of an active glucase furnished by the succus entericus of the small intestine.

"It could be shown by other experiments that the proteolytic ferment present was trypsin and not pepsin; it acted best in an alkaline, poorer in a neutral, and very poor or not at all in an acid solution. Besides, in one experiment the presence of leucin and tyrosin as the end-product of the proteolytic fermentation was shown. This proved beyond doubt that the proteolytic ferment present was trypsin. Only once did we succeed in demonstrating the presence of lipase; but it is a well-known fact that the latter is a very unstable enzym,

easily destroyed and hard to obtain except by direct watery extracts from fresh pancreatic tissue."

The author studied especially the susceptibility of the enzyms present in the digestive juices to a number of medicinal substances and the results reported have to do particularly with these questions.

Concerning "secretins," O. von Fürth and C. Schwarz (*Arch. Physiol. [Pflüger]*, *124 (1908)*, *No. 9–10, pp. 427–446*).—The authors conclude that "secretin" is a mixture of substances of which cholin is one.

Respired air, W. Weichardt (*Arch. Hyg., 65 (1908)*, *No. 3, pp. 252–274, pls. 2, figs. 4*).—From his studies of respired air the author concludes that it may have toxic properties due to the presence of kenotoxins.

Muscular work and pulse rate, T. A. Auto (*Skand. Arch. Physiol., 21 (1908)*, *No. 2–3, pp. 146–160, figs. 12*).—From experiments with men the author concludes that neither kneading the muscles, passive movements, nor severe rubbing of the skin, increases the pulse rate in any marked degree. The changes in respiratory movements and circulation which attend muscular work are not sufficient to account for the acceleration of the heart beat. The author concludes that the results of his investigations strengthen the theory that this increase noted in muscular work is chiefly due to the excitation of the nerve centers of the heart.

Concerning the body temperature of man, D. Rancken (*Skand. Arch. Physiol., 21 (1908)*, *No. 2–3, pp. 161–236, figs. 23*).—From his investigations the author concludes that muscular work exercises a marked effect on the variations in body temperature. Hot or cold food naturally has an effect on body temperature, but aside from this, the ordinary diet does not affect rectal temperature when no muscular work is performed. The temperature changes which other investigators have attributed to eating food are in the author's opinion due to increased heat production in the muscles, ascribable either to increased muscular work or increased muscular tonus, due to the work of chewing the food and the comfortable feeling which accompanies eating something which is palatable.

Animal heat, S. Tolkowsky (*Ann. Gembloux, 18 (1908)*, *No. 11, pp. 638–652, figs. 2*).—A digest of data on the subject.

ANIMAL PRODUCTION.

The feeding value of cereals as calculated from chemical analyses, J. S. Chamberlain (*U. S. Dept. Agr., Bur. Chem. Bul. 120, pp. 64*).—This bulletin discusses different methods of calculating feeding values and reports results of a chemical study of the feeding value of oats, wheat, barley, and other cereals. Analyses of home and foreign-grown grains, and the production values of these grains as computed from chemical analyses, are presented in tabular form.

Among the terms discussed in the introductory part are: Coefficient of digestibility, metabolizable energy, production values, and nutritive ratio. Explanations are given for expressing the "production value," Kellner's term for the value of the material fed in addition to a basal maintenance ration in three different ways, as follows: (1) Calories per 100 lbs., (2) pounds of flesh gained per 100 lbs., and (3) starch value per 100 lbs.

The production values in calories for the various nutrients correspond to the production of a definite weight of body tissues, and in the investigations reported in this bulletin the value of each nutrient of which the cereal is composed is expressed in terms of pounds of flesh gained per 100 lbs. of feed when

fed to mature cattle. The factors used are those given by Kellner except in the case of sorghum, to which material the recent results of Tangl are deemed more applicable. The term "pounds of flesh gained" is not considered as synonymous with gain in live weight, as the latter includes the increase of water also, but "the two terms are approximately the same and express the increase in flesh or weight as the result of feeding 100 lbs. of food in addition to a basal maintenance ration."

From analyses of several varieties of domestic and foreign-grown oats "it is evident that the characteristic tendency of the oats grown in the United States, when compared with oats grown in Europe, is toward a higher protein content with a correspondingly lower amount of carbohydrate, resulting in a narrow nutritive ratio combined with a slightly lower production value." The differences in production values are not great, the maximum difference being about 0.25 lb. of flesh gain per 100 lb. of grain fed.

"The average production value for five groups of United States oats is 17.87 lbs. of flesh gained, or 77,266 calories, while the average of the three groups of foreign oats is only 18.26 lbs. of flesh gained, or 78,954 calories, a difference of only 0.39 lb. of flesh gained, or 1,688 calories. This difference is not large, especially when it is remembered that the purely domestic oats have a mean production value of 18.11 lbs. of flesh gained, only 0.15 lb. below the foreign average.

"The nutritive ratio, however, shows a very noticeable difference. The nutritive ration of the domestic oats, with one exception, varies from 1 : 4.6 to 1 : 6.6, while that of the foreign is 1 : 7.0 to 1 : 7.3."

Swedish select oats were grown in 20 States. From 4 States the protein was approximately equal to the foreign-grown oats, and only 4 out of the 20 fell below the foreign grown. Foreign-grown barley also was found to be poorer in protein and richer in carbohydrates, higher in productive value and broader in nutritive ratio.

"The maximum protein content was found in the 2 United States samples of Kitzing [barley], namely, total, 15.25 lbs. per 100 lbs., or 10.67 lbs. digestible, the carbohydrate in the same sample being 75.56 lbs. total and 69.51 lbs. digestible. The lowest protein content, on the other hand, was found in the 8 foreign-grown samples, namely, 12.52 lbs. total and 8.76 lbs. digestible, the carbohydrate in the same samples being 78.03 lbs. total and 71.78 lbs. digestible. The production value of the United States Kitzing was 21.03 lbs. of flesh gained or 90,912 calories and of the foreign samples 21.19 lbs. of flesh gained or 91,604 calories, the nutritive ratio being 1 : 7.0 for the domestic and 1 : 8.8 for the foreign.

"With both of these grains this increase in protein is an improvement. It increases the high-protein, muscle-producing value of the oats and raises the intrinsic food value of the barley, so that it becomes more nearly equal to that of wheat. Selection and breeding for high-protein content in feeding barleys is a distinct improvement in their value for this purpose."

Analyses and production values are also given of emmer, einkorn, wheat, barley, proso, sorghum, and maize.

"As feeding grains the cereals may be grouped into three classes typified by our three most common grains, namely, (*a*) oat group, (*b*) wheat group, (*c*) maize group.

"Of these three groups the oat group stands at one end as a typical muscle or energy producing food and the maize group at the other end as fat or heat producing. The wheat group is intermediate between these two.

"In the oat group belong the less common cereals, emmer and einkorn, and in the maize group proso and nonsaccharine sorghum.

"The two cereals emmer (*Triticum dicoccum*) and einkorn (*Triticum monococcum*) belong to the same group as the oats and like it are characterized by high protein and relatively low carbohydrate. They have a lower intrinsic food value than the other grains, but a narrow nutritive ratio and consequently are muscle or energy producers. In food value they are nearly the same as oats, and their cultivation where oats can not be grown is to be advocated.

"The two cereals proso or broom-corn millet (*Panicum miliaceum*) and the nonsaccharine sorghum (*Andropogon sorghum*) belong to the maize group, and though lower in food value than maize itself they equal the oat group. They are of great importance when maize can not be grown and when there is need for a high carbohydrate and heat or fat producing food.

"Barley and rye belong to the wheat group and are nearly equal to it in food value."

Modern views concerning the food requirements of farm animals and the principles of rational feeding, N. Hansson (*Nord. Mejeri Tidn., 23 (1908), Nos. 42, pp. 495–497; 43, pp. 508, 509; 44, pp. 520–522*).—An address which discusses the results of recent studies conducted by Kellner, the Copenhagen Experiment Station and others, of feeding problems and the nutritive effect of different food components. The author has crystallized his deductions into feeding standards showing the amounts of digestible protein and total feed units (1 "feed unit" equaling 0.6 starch value) required per head daily under varying conditions, in the case of dairy cows, fattening steers, young cattle, working oxen and horses, and fattening and breeding swine.

The mineral elements in animal nutrition, E. B. Forbes (*Ohio Sta. Bul. 201, pp. 129–172*).—This is an important summary of available data. The main facts regarding the function of the mineral elements in animal nutrition are presented in such manner as to serve the student of agriculture as an introduction to this important subject.

Commercial feeding stuffs, E. H. Jenkins and J. P. Street (*Connecticut State Sta. Rpt. 1907–8, pt. 10, pp. 717–762*).—The 218 samples of feeding stuffs analyzed under the State law and 55 samples sent by individuals included cotton-seed and linseed meals, wheat bran, middlings, and feeds, maize meal, maize for ensilage, gluten feeds, hominy feed, rye, buckwheat, flax and barley products, distillers' and brewers' grains, spent hops, dried beet pulp, meat scrap, proprietary stock and poultry feeds, mixed feeds, and miscellaneous materials. Nine brands of gluten feed contained artificial coloring matter. The acidity of the gluten feeds is reported as determined with different indicators, the results being lowest with litmus, and considerably higher with phenolphthalein and Toepfer's reagent. Several proprietary feeds were found to contain large quantities of weed seeds, one brand of flax feed, costing $25 per ton, containing 86,000 weed seeds per pound.

Commercial feeding stuffs in 1907–8, J. W. Carson and G. S. Fraps (*Texas Sta. Bul. 117, pp. 5–67*).—This bulletin contains the text of the State feeding stuffs law and reports and discusses the results of the first year's operation. Analyses are given of 1,642 samples of feeding stuffs, which included cotton-seed meal and cakes, wheat bran, shorts and chops, rice polish, bran and hulls, corn chops, crushed ears and bran, Kafir corn chops, milo maize chops, and mixed feeds. A list of the provisional standards and definitions is included.

Concentrated commercial feeding stuffs, A. McGill (*Lab. Inland Rev. Dept. [Canada] Bul. 156, pp. 26*).—This bulletin contains analyses of bran, middlings or shorts, linseed meal, cotton-seed meal, chopped feed, and other concentrated feeding stuffs.

Sugar-producing product (desiccated beet root), G. W. McMullen (*U. S. Patent 898,592, Sept. 15, 1908; Jour. Soc. Chem. Indus., 27 (1908), No. 24, p. 1216*).—A patent has been obtained for a process of drying sugar beets. The beets are so sliced and desiccated as to preserve their sugar content in an uninverted state. The slices are spread in thin layers in a closed chamber in which a reduced pressure is maintained and the water is evaporated at a temperature of about 155° F. The desiccated slices, which should contain less than 30 per cent of moisture, are ground and may be preserved unchanged for an indefinite period.

Steer feeding, J. M. Scott (*Florida Sta. Bul. 96, pp. 29–37, figs. 8*).—In the experiments reported in this bulletin 16 Shorthorn native steers were divided into 4 lots and fed for 84 days. The feeds compared were crab-grass hay, velvet beans, and sorghum silage, which were grown on the station farm and estimated to be worth $4, $6, and $3 per ton, respectively, which is about the actual cost of production. The other feeds were purchased in the market.

The lot fed corn, cotton-seed meal, and crab-grass hay made an average daily gain per head of 2.583 lbs., at a cost of 9.07 cts. per pound, whereas for the lot fed corn, cotton-seed meal, sorghum silage, and cotton-seed hulls the corresponding gain was 2.681 lbs., at a cost of 10.65 cts. per pound, for the lot fed corn, velvet beans in the pod, and cotton-seed hulls 2.922 lbs., at a cost of 7.55 cts. per pound, and for the lot fed cotton-seed meal and cotton-seed hulls 1.848 lbs., at a cost of 12 cts. per pound.

Although all these steers were fed at a loss because of abnormal conditions, the author thinks "the feeding period required to fatten cattle in Florida is shorter than in the Northern States. The average daily gain that may be obtained in Florida by proper methods of feeding is larger than the northern feeder can expect. A combination of corn, velvet beans in the pod, and some roughage(such as cotton-seed hulls, crab-grass hay, or sorghum hay), with a nutritive ratio of 1 : 6 or 1 : 7, will give best results."

Raising calves on skim milk, C. H. Eckles (*Missouri Bd. Agr. Mo. Bul., 6 (1908), No. 6, pp. 3–14, figs. 3*).—A summary of information on calf raising gleaned from various sources and written for the practical farmer.

The cost of raising young stock, F. Dettweiler (*Deut. Landw. Presse, 35 (1908), Nos. 91, pp. 955, 956; 92, pp. 963, 964; 94, pp. 982–984; 95, pp. 993, 994*).—From statistics gathered from a large number of practical breeders it was found that the cost of feeding a heifer the first 12 months varied from 85 to 298.7 marks (about $20 to $70), and the second year from 71 to 255 marks ($17 to $60). The total cost from birth to calving time varied from 165 to 624 marks ($40 to $150).

The preparation of a herd book for cattle, A. König (*Landw. Jahrb. Schweiz, 22 (1908), No. 12, pp. 625–708*).—This is an elaborate plan originated by the author for keeping the pedigrees of live stock.

The sheep industry from the market standpoint, W. C. Coffey (*Illinois Sta. Circ. 125, pp. 16, figs. 3*).—This circular presents data regarding the location and development of the principal sheep markets in this country, the nature of the supply of sheep received at the Chicago market, factors to consider in handling sheep and lambs intended for market, shipping sheep and lambs to market, and the purchasing of feeders and breeding sheep on the open market.

Sheep husbandry in Canada, J. B. Spencer (*Canada Dept. Agr., Branch Live Stock Comr. Bul. 12, pp. 127, pls. 27, figs. 13*).—This is a description of the breeds of sheep and a general treatise on sheep husbandry in Canada.

The raising of sheep and goats for milk production, J. de Castro (*Prog. Agr. y Pecuario, 14 (1908), No. 591, pp. 467–471*).—A general discussion of the subject. Analyses of the milk of goats and ewes are given.

Annual wool review, J. B. McPherson (*Bul. Nat. Assoc. Wool Manfrs., 38 (1908), No. 4, pp. 353–396, chart 1*).—A review of the wool industry for 1908 with much statistical matter. In New Mexico and Arizona the number of sheep fit for shearing increased during the year. The price of wool was 15 per cent lower than in 1907. A storage warehouse was built at Omaha, where 1,000,000 lbs. of wool was stored until the market partially recovered. A movement is on foot to establish a permanent storage warehouse in the Central West, where wool can be stored and sold directly to the manufacturer.

On digestion of meat in the stomach and small intestine of swine, E. Lörsch (*Zur Kenntnis der Verdauung von Fleisch im Magen u. Dünndarme des Schweines. Inaug. Diss., Univ. Leipsic, 1908, pp. 54, fig. 1*).—Horse flesh, from which all fat had been removed, was ground, cooked for 1 hour, and washed until the wash water showed no biuret reaction. Six swine were fed 500 gm. each of this meat, and the protein metabolism was studied by post-mortem examinations of the stomachs and small intestines. In all cases 2 hours after feeding time there was an acid reaction in all parts of the stomach, though from ½ to 1 hour after the feeding period near the opening of the esophagus the reaction was alkalin. Chemical analyses were made of different portions of the stomach. After ½ hour digestion, cleavage products of protein were found in all portions.

The following table shows the cleavage products of the mixed contents in the stomach at different periods:

Protein cleavage products in the stomach of swine.

Hours after feeding period.	Total nitrogen.	Coagulable nitrogen.[a]	Total incoagulable nitrogen.[a]	Syntonin.[a]	Albumoses.[a]	Peptone.[a]	Other incoagulable nitrogenous substances.[a]
	Grams.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
One-half	32.93586	91.90	8.10	0.58	5.49	1.19	0.84
One	24.86645	92.44	7.56	1.11	4.82	.66	.97
Two	22.29092	81.13	18.87	.91	13.70	2.87	1.39
Four	15.27238	86.01	13.99	1.17	9.62	.59	2.61
Six	14.02625	79.08	20.92	1.15	12.09	5.64	2.04
Eight	5.88262	89.53	10.47	3.77	4.38	1.03	1.29

[a] Per cent of the total nitrogen.

The cleavage products in the small intestines at different intervals are shown in the following table:

Protein cleavage products in the small intestine of swine.

Hours after feeding period.	Total nitrogen.	Coagulable nitrogen.[a]	Incoagulable nitrogen.[a]	Albumoses.[b]	Peptone.[b]	Other incoagulable substances.[b]
	Grams.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
One-half	1.50469	46.80	53.20	28.24	40.96	30.80
Two	3.83190	47.67	52.33	21.39	45.28	33.33
Four	3.33200	30.62	69.38	29.07	2.81	68.12
Six	2.39044	26.37	73.63	21.13	27.13	51.74
Eight	3.24190	51.82	48.18	31.88	38.50	29.62

[a] Per cent of the total nitrogen. [b] Per cent of the total incoagulable nitrogen.

Syntonin was found in the pylorus as well as in the cardia and fundus. The pig being omnivorous the amount of syntonin found was less than other investi-

gators have found in herbivorous animals and more than in the carnivorous animals. The protoalbumose was much less than the other albumoses, which were less in the pylorus than in other parts, but the difference increased during the process of digestion. Peptone and nitrogenous substances not precipitated by picric and phosphotungstic acids remained fairly constant in all portions. The percentage of acidity was much the highest in the pylorus. In the small intestine the percentage of peptone was much larger than in the stomach.

Food requirements of growing and fattening swine, W. Dietrich (*Illinois Sta. Circ. 126, pp. 18, chart 1*).—This circular presents deductions drawn from experiments in pig feeding now in progress at the Illinois Station. A method of feeding is outlined by which 40 per cent greater gains in live weights were produced than by the use of the Wolff-Lehmann standard.

"It was found that maximum gains are produced at a minimum cost, by starting the pig on approximately 0.6 lb. of digestible crude protein per day per 100 lbs. live weight, increasing the quantity to 0.7 during the first 7 weeks, decreasing to 0.6 the following 4 weeks, and then feeding 0.65 lb. during the last 7 weeks of the growing period. During the first 4 weeks of the fattening stage this is reduced to approximately 0.33 lb., which is fed to the close."

The deposition of fat and lean in hogs, R. R. Dinwiddie and A. K. Short (*Arkansas Sta. Bul. 103, pp. 237–250, figs. 9*).—Comparative tests were made of the lard and bacon types of hogs in the utilization of wide and narrow rations.

In all, 38 pure-bred hogs were fed, the lard type being represented by the Poland-China, Berkshire, Duroc Jersey, and Ohio Improved Chester, and the bacon type by the Yorkshire and Tamworth. The rations fed consisted of corn chops, bran, middlings, blood meal, and tankage, and there were 6 feeding periods of 21 days each. With the lard type of hog 2 lots on a narrow ration with a nutritive ratio of 1:3, made an average daily gain per head of 1.42 and 1.21 lbs., respectively, whereas 2 lots with which there was a wide nutritive ratio, 1:8, made corresponding gains of 1.07 and 0.51 lbs., respectively, and 1 lot with a medium nutritive ratio, 1:5, made an average daily gain of 0.8 lb. per head. On similar rations the average daily gains per head were for 2 lots of the bacon type on a narrow ration 1.54 and 1.29 lbs., respectively, for 2 lots on a wide ration 0.89 and 0.29 lb., respectively, and for 1 lot on a medium ration 0.93 lb. The bacon hogs made more noticeable gains during the first half than in the last half of the test.

"Measured by actual increase in weight and by increase relative to feed consumed, the lard type of hog possesses much the larger capacity for utilizing rations of wide nutritive ratio.

"By the same standard the bacon hogs showed slightly the greater capacity for digesting narrow or proteid rations. . . .

"In both types of hogs the largest increase in weight relative to feed consumed and apparently the fattest hogs resulted from the feeding of the more nitrogenous ration.

"Of all the breeds tested the Tamworth proved to be least adapted for growth on an exclusive corn ration.

"At the close of our feeding experiments all the lard type of hogs both on narrow and wide rations, although varying in weight, were in a finished condition, ready for the butcher. Moreover, the most typical 'fat back' of all was a Berkshire fed on narrow ration. Of the 5 bacon hogs on wide ration 2 only (Yorkshires) were fit for slaughter."

Pork production under North Dakota conditions, W. B. Richards (*North Dakota Sta. Bul. 83, pp. 797–831, figs. 16*).—This bulletin describes the best methods of rearing and feeding swine in North Dakota, the information contained therein being based on results of experiments at this station and on the

experience of some of the best farmers. The topics discussed are the practicability of swine raising in North Dakota, bacon *r.* lard hogs, the selection and methods of handling breeding stock, feeding and management of the young pigs, the use of forage crops, hog fences, finishing for market, sanitation dipping, etc., shelter, and preventive measures concerning hog cholera and swine plague.

Protein digestion in horses. E. ROSENFELD (*Über die Eiweissverdauung im Magen des Pferdes. Inaug. Diss., Univ. Leipsic, 1908, pp. 55, fig. 1*).—The author made post-mortem examinations of the contents of the stomach and small intestines of 9 horses, each of which had been fed 1,500 gm. of oats.

In general, these results agree with those of Grimmer (E. S. R., 18, p. 1069). The pylorus portion contained a larger percentage of water than other parts of the stomach. One-half hour after eating all portions of the stomach were alkalin, and the esophagus end of the stomach remained alkalin for an hour. In one horse the reaction was neutral 3 hours after eating, whereas in all other cases reactions were acid after one-half hour.

The percentage of protein products in the stomach at different periods are given in the following table:

Protein cleavage products in the stomach of horses.

Hours after feeding period.	Total nitrogen.	Soluble nitrogen.[a]	Incoagulable nitrogen.[a]	Syntonin +soluble coagulable nitrogen.[a]	Albumoses.[a]	Peptone.[a]	Other soluble nitrogen.[a]
	Grams.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
One-half	20.3875	31.45	19.93	11.52	10.89	4.59	4.45
One	19.1172	27.67	19.74	7.93	10.10	3.75	5.89
Two	17.8840	39.43	28.72	10.71	10.30	11.69	6.77
Three	16.7199	36.76	22.79	13.97	.....	.....	.....
Four	21.9480	37.26	33.47	3.79	16.12	10.42	6.93
Six	9.3743	47.77	45.60	2.17	20.19	17.37	8.04

[a] Per cent of total nitrogen.

The cleavage products in the small intestines at different intervals are shown in the following table:

Protein cleavage products in the small intestine of horses.

Hours after feeding period.	Total amount of nitrogen.	Total coagulable nitrogen.[a]	Total incoagulable nitrogen.[a]	Total albumoses.[b]	Peptone.[b]	Other incoagulable nitrogen.[b]
	Grams.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
One-half	4.0353	38.61	61.39	35.83	15.54	48.63
One	4.7961	20.05	79.95	27.49	16.31	56.20
Two	7.5180	25.89	74.11	20.00	25.56	54.44
Three	4.3600	41.27	58.73	20.27	39.71	40.02
Four	5.8261	51.25	48.75	14.04	30.99	54.97
Six	4.6469	22.38	77.62	34.47	26.58	38.95
Three	3.3012	8.02	91.98	40.54	39.00	20.46

[a] Per cent of total nitrogen. [b] Per cent of total incoagulable nitrogen.

At the beginning of the digestive period there were more products of protein hydrolysis in the fundus than in other portions of the stomach, but this difference did not continue for any considerable length of time. Protein digestion was very rapid in the small intestine. Albumoses were there far less in amount than the simpler compounds.

Diastasolin as a nutrient for horses, SCHADE (*Deut. Tierärztl. Wchnschr., 17 (1909), No. 4, pp. 45–48*).—The author added small quantities of diastasolin to the ration of 4 coach horses. At the end of 9 days they had gained an average of 4.6 kg. each in weight, though they had been kept at work. Good results were also obtained by feeding diastasolin to sick horses.

Egg records (*Dept. Agr. and Tech. Instr. Ireland Jour., 9 (1908), No. 1, pp. 121–128*).—Egg-laying statistics gathered from breeders of White and Brown Leghorns, Black Minorcas, Buff and White Orpingtons, White Wyandottes, Plymouth Rocks, Faverolles, Houdans, Light Sussex, and mixed flocks are reported. The best record was made by the Brown Leghorns, which laid an average of 39.6 eggs each from July 1 to September 30. The Houdans laid an average of 21.8, which was the lowest record of any breed.

The egg trade of the United States, M. M. HASTINGS (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 140, pp. 34, figs. 2*).—This is a study of the conditions which surround the production and marketing of eggs, made for the purpose of determining the causes of deterioration in quality and consequent loss. The topics discussed are the importance of the poultry industry, quality in eggs, detrimental changes, methods of marketing and preservation, requisites for the production of good eggs, and how to effect improvement for the benefit of both producer and consumer.

The author states that the enormous waste due to the actual spoiling of eggs is caused by ignorance of the correct method of caring for the product and because the farmer and storekeeper are not financially rewarded for taking greater pains. This latter condition will continue until the present method of bartering eggs for merchandise is discontinued for some plan of buying eggs on a quality basis.

Infection and preservation of eggs, G. H. LAMSON, Jr. (*Connecticut Storrs Sta. Bul. 55, pp. 203–214, figs. 7*).—This bulletin reports bacteriological studies with reference to the cause of decomposition and sources of infection of eggs, the part played by temperature, and precautions to be observed in preserving eggs.

Dissections of hens were made by the author and the ovary and oviduct were examined. "Bacteria [were present] in the oviduct of the hen even in the upper portion, so that an egg may be infected in the earlier stage of its formation, particularly at the time when the white or albumin is secreted. A diseased condition of the ovary of the hen may cause infection of the eggs. Poultrymen, especially those who dress large numbers of fowls, frequently find hens that are so diseased. . . . Unfertile eggs are infected as well as fertile. . . .

"Eggs may be infected after they have been laid, as it is possible for the bacteria to pass through the pores of the shell. Moisture plays a part in such infections, for while the egg is covered with its normal mucilaginous coating and kept in a dry place it is difficult to infect. Infection is not a difficult matter, however, when the egg is moist. Many egg shells are defective, caused by not feeding hens a sufficient amount of shell-forming food. Eggs are liable to be infected soon after they are laid." Nine species of bacteria were found in one nest, hence the author thinks that nesting material is a great source of infection, for if this has been allowed to remain unchanged for a long time it becomes foul and teems with bacteria.

"Whatever the means of infection, it has been found that a larger percentage of the July, August, and early September eggs are infected or contain a greater

number of bacteria (at a time they may be called 'fresh') than the eggs of the other months of the year, particularly when compared with the eggs laid during the months of April, May, and June. This corroborates the opinion of egg packers, who invariably prefer April, May, and June eggs to those produced during the other months of the year. . . .

"The fact that an egg contains bacteria does not mean that it is worthless. The question is mainly whether or not they are present in large numbers, and if present in small numbers, whether or not they are likely to multiply.

"Bacteria which are commonly found in eggs do not multiply at low temperatures. An egg that is kept at 34° F. is safe from decomposition. Repeated experiments have shown that the rapid growth of bacteria does not occur until the temperature is raised over 55°. While there is some growth at temperatures lower than 55°, it is very slow. At the temperature of 98.6° the bacteria in the egg multiply rapidly. In order to demonstrate the rapid multiplication of bacteria resulting in decomposition, a dozen (January) eggs were taken, and in six of them small holes were made and into each egg bacteria from a rotten egg were introduced on a platinum loop. These holes were sealed with wax and the eggs thus infected, together with the six untreated eggs, were placed in an incubator running at a temperature of 110°. In 48 hours the 6 eggs which had been infected were so badly decomposed as to be very offensive and the remaining six showed no changes in them."

Directions are given for using water glass in the preservation of eggs.

Humane slaughtering. Improved foreign methods (*Mo. Cons. and Trade Rpts.* [*U. S.*], *1908, No. 338, pp. 105–118*).—This is a report by American consular officers on the methods of slaughtering animals for food in France, Germany, Italy, Belgium, United Kingdom, Austria, Russia, the Netherlands, British India, China, and Japan. The operations vary widely in cities of the same country, there being apparently no uniform laws, though the cities have regulations and restrictions.

Recent theories and experiments on heredity and inheritance. II. DRINKWATER (*Brit. Med. Jour., 1908, No. 2499, pp. 1538–1541*).—A review of the principal theories that have been propounded.

The possibility of inheritance through the placental circulation instead of through the germ cells, F. T. LEWIS (*Amer. Nat., 42 (1908), No. 494, pp. 134–136*).—Attention is called to the recent work of Theobold Smith and others in the inheritance by mice, guinea pigs, and rabbits of immunity to toxic substances. As this immunity is inherited through the females only it is suggested that immunity and also hemophilia may be caused by a substance in the blood and thus be inherited through the somatic elements. As the next generation only are immune, it is not a case of inheritance of acquired characters as ordinarily understood by biologists.

Recent researches on the determination and heredity of sex, E. B. WILSON (*Science, n. ser., 29 (1909), No. 732, pp. 53–70, figs. 2*).—This is the address of the vice-president of the American Association for the Advancement of Science, at Baltimore, December, 1908.

Sex production is a phenomenon of heredity. Every form of heredity is in a sense a response of the developing organism to external stimuli. Male and female are relative terms and denote tendencies only. The work of earlier investigators on this subject was not of sex determination but rather of suppression of one set of organs. More recent investigation on insects, amphibia, mammals, Bryophyta, and pollen grains of higher plants has led to negative re-

sults. In many organisms the fertilized egg is predetermined as male, female, or hermaphrodite. The sex of the individual is unalterable by external conditions. Double monsters, multiple embryos, and secondary embryos are always the same sex when derived from the same egg. Cytological studies on the dimorphic spermatozoa of insects, myriopods, and arachnids show that spermatozoa which do not contain the accessory chromosome are not functional.

The author points out the difficulties in the way of accepting the Mendelian theories of sex heredity suggested by Castle, Correns, and Bateson, and he proposes the provisional hypothesis that a single X-element (in the simplest cases represented by the accessory chromosome) in itself causes or determines the male tendency, while two such elements in association create, or at least set free, the female tendency. Evidence now indicates that in dioecious organisms sex production is primarily adapted for the production of males and females in equal number.

A new color variety of the guinea pig, W. E. Castle (*Science, n. ser., 28 (1908), No. 712, pp. 250–252*).—The author believes that color inheritance in all its phases seems to conform to Mendel's law of heredity. In guinea pigs there are three different kinds of pigments, black, brown, and yellow. In the wild guinea pig these pigments are so placed on the individual hair as to give it a banded appearance. The banding is inherited as a factor independent of the colors present. Any mating that brings all four factors together will result in a return to the original color of wild forms. If this hypothesis is correct it ought to be possible to produce a color variety of guinea pigs not previously known.

True to this prediction the author obtained a new variety in the following way: "Agouti-colored individuals were crossed with chocolates. The young were all agouti-colored. But when mated with each other these agouti young produced offspring of four sorts, agouti, black, cinnamon-agouti, and chocolate. The cinnamon agoutis are a sharply defined and unmistakable new variety, differing from the wild type in the total absence of black pigment from the eye, the skin of the extremities, and from the hair. . . . We are able to predict the production of new varieties, and to produce them. We must not, of course, in our exuberance, conclude that the powers of the hybridizer know no limits. The result under consideration consists, after all, only in the making of new combinations of unit characters, but it is much to know that these units exist and that all conceivable combinations of them are ordinarily capable of production. This valuable knowledge we owe to the discoverer and to the rediscoverers of Mendel's law."

Inheritance in canaries, C. B. Davenport (*Carnegie Inst. Washington Pub. 95, pp. 26, pls. 3*).—The author bred crested and noncrested canaries of the short or German type to see if the crest was alternative and dominant as in the case of poultry and pigeons, as previously reported (E. S. R., 18, p. 271).

Of 102 offspring of 2 noncrested parents all were noncrested. Crested offspring were obtained from crested parents. Of 66 offspring from 2 heterozygous crested parents, 18 were noncrested and 48 crested. This is very close to the 25 and 75 per cent which theory calls for. A heterozygous parent was crossed with a crested parent and the result was 52 noncrested and 42 crested offspring. The crest is thus found to be dominant in canaries as well as in other birds. The advice of practical men that 2 crested birds should not be mated as they produce baldness is based on an error.

The inheritance of plumage color was studied with green, yellow, lizard, and cinnamon colored canaries. Crosses were also made between the European goldfinch and the yellow canary, with the following results:

"The yellow canary is derived from the original 'green' canary by the loss of black. It carries a mottling factor. Consequently when the yellow canary is crossed with a pigmented canary or with a finch the hybrids are mottled.

"The mottling is not a fixed pattern. The spots vary in position and relative size—they may cover nearly the whole body or they may form a mere 'ticking.' The degree of mottling is inheritable. Ticking behaves as a unit-character.

"Mottling is a heterozygous character and throws mottled, clear yellow, and self-greens.

"The principle of localization of the units of a complex plumage must be recognized. The cap of the Lizard canary, the red face of the goldfinch, the shoulder striping of the green canary are not only unit-characters but they occur only at their proper localities and in their proper forms in the body plumage. In mottled canaries the presence of black on the shoulder means striping, on the wing it means dead black, white-laced remiges, on the mid-breast it means a uniform olive color. The plumage of a yellow canary may be compared with a letter that has been written with invisible ink. Wherever the developer acts (i. e., the black pigment of the green canary is added) that which is written appears with all of its idiosyncrasies."

The influence of the testes upon the secondary sexual characters of fowls, C. E. Walker (*Proc. Roy. Soc. Med. [London], 1 (1908), No. 6, pp. 153–156, figs. 5; abs. in Arch. Rassen u. Gesell. Biol., 5 (1908), No. 4, pp. 565, 566*).—The macerated testes of a cock were strained, mixed with normal salt solution, and subcutaneous injections of ½ cc. made daily on 2 adult laying hens from February 1 to August 30, 1907. From that time until October 4, when the injections were discontinued, the amount of extract was reduced one-half.

A few days after beginning the injections the combs and wattles became brighter in color and grew considerably until the end of June. By October 4 they became bluish, wrinkled, and flabby. There was no noticeable change in the spurs. From the middle of March the hens ceased laying until January, 1908. Though peaceable at the beginning of the experiment they began to attack the cocks a few weeks later. Evidently the testes possess some function which influences or controls the appearance of the secondary sexual characters. The potentiality of differentiation necessary to the production of some at any rate of these characters is present in the cells of the female.

DAIRY FARMING—DAIRYING—AGROTECHNY.

The farm dairy, H. B. Gurler (*Chicago, Ill., 1908, pp. 164, pls. 38, figs. 3*).—This popular work, which treats of the dairy herd, cow stables, rations for dairy cows, silos, handling of milk, butter making, and other dairy matters, is of a practical nature. The author dedicates it "to the boys, hoping that it will help them to see the opportunities in the field of agriculture and especially in dairying, the most profitable branch of agriculture when its possibilities are developed."

The care of milk on the farm, I. P. Whitney (*Washington Sta. Popular Bul. 12, pp. 4*).—This bulletin contains brief notes on the proper care, handling, and cooling of milk on the farm to avoid premature souring or contamination from dirt and bacteria.

The score-card system of dairy inspection, C. B. Lane and G. M. Whitaker (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 139, pp. 32, dgms. 2, map 1*).—The score-card system of inspecting the milk supply is explained, and its advan-

tages for the inspector, the dairyman, and the consumer are pointed out. An improved form of score card, which was prepared to secure uniformity in dairy inspection, is explained in detail, and directions are given for using the card for scoring dairy farms and city milk plants. A plan for systematizing and simplifying the work for dairy inspection is described. A list of publications on the testing of milk and cream is appended.

Dairy investigations, O. F. Hunziker (*Indiana Sta. Rpt. 1908, pp. 62–69*).—Preliminary results are reported of studies on the moisture content of butter and the factors which control its variation, the influence of the period of lactation on the proteids in milk, the effect of heat on milk albumin, the financial loss to creameries by improperly kept composite samples of cream, and the conditions controlling the percentage of solids in the preparation of condensed milk.

The influence of interrupted milking on the composition of milk, K. Windisch (*Württemb. Wchnbl. Landw., 1908, No. 51, pp. 849–851; Milchw. Zentbl., 4 (1908), No. 12, pp. 535–538*).—Chemical analyses were made and the specific gravity determined in cow's milk when the first and last portions were drawn into separate receptacles.

How many grams of digestible protein are needed to produce one kilogram of cow's milk? J. R. von Marszalkowicz (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 8, pp. 669–700, dgms. 2*).—A critical discussion of the work of Armsby, Jordan, Kellner, Hollmann, and others in cattle feeding. The author thinks that with a ration containing abundant carbohydrates and 600 gm. of protein per 1,000 kg. live weight, a cow requires on an average not more than 37 gm. of digestible protein to produce 1 kg. of milk. In support of this view the experiments of the author are cited.

The variation in the composition of milk, A. Lauder (*Edinb. and East of Scot. Col. Agr. Bul. 15, pp. 35*).—This bulletin contains data as to the yield and composition of the milk of 22 Shorthorn cows which constitute the dairy herd at the Mid-Lothian and Peebles county asylum, Rosslynlee.

The composition of asses' milk, B. Wagner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 3, pp. 174, 175; abs. in Chem. Zentbl., 1908, II, No. 11, p. 970*).—The author gives analyses of the milk of she-asses at different periods after foaling. On the first day there was 8.116 per cent of fat, on the fifth day 2.587 per cent, and on the thirty-fifth day 1.55 per cent of fat. The milk sugar and other solids remained fairly constant.

The acidity of milk, H. G. Chapman (*Proc. Linn. Soc. N. S. Wales, 33 (1908), pt. 2, pp. 436–443*).—The acidity of fresh milk, according to the author, is not due to lactic acid but to phosphates and caseinogen. The capacity of milk to combine with sodium hydroxid is increased by heating and diminished by dilution.

Investigations on milk serum, A. Burr, F. M. Berberich, and F. Lauterwald (*Milchw. Zentbl., 4 (1908), Nos. 4, pp. 145–156; 5, pp. 210–237; 6, pp. 262–275; Molk. Ztg., 22 (1908), Nos. 15, pp. 401–403; 16, pp. 431, 432*).—Studies were made of fresh milk, skim milk, cream, buttermilk, pasteurized milk, and milk coagulated in various ways. Chemical analyses were made and the specific gravity, percentage of acidity, and other properties were determined. Special attention was given to the specific gravity of the sera of whole milk, skim milk, and buttermilk.

The acetic acid method for coagulating milk is recommended as it is rapid, does not affect the specific gravity of the serum, produces no fermentation, and all of the albumin remains in the serum. Rennet is not a good chemical precipitant for raw milk and much less so for pasteurized milk. The average

results obtained from unpasteurized milk, cream, skim milk, buttermilk, and milk sera are summarized in the following table:

Chemical composition and properties of milk, skim milk, cream, and buttermilk and the sera therefrom.

Number of investigations.	Nature of coagulation.	Specific gravity.	Water.	Nitrogen.	Fat.	Fat-free dry matter.	Degree of acidity (Soxhlet-Henkel).
			Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	
8.....	Milk.....	1.0307	91.04	.....	3.57	8.63	.....
	Whole milk sera:						
8.....	Acetic acid.....	1.0285	93.39	0.37	.24	6.60	26.9
8.....	Spontaneous ...	1.0277	93.65	.98	.05	6.35	24.8
4.....	Rennet.....	1.0278	93.48	1.09	.11	6.51	4.4
	Skim milk sera:						
8.....	Acetic acid.....	1.0284	93.42	.93	.04	6.58	25.7
8.....	Spontaneous ...	1.0276	93.64	.97	.03	6.36	23.7
4.....	Rennet.....	1.0274	93.48	1.11	.09	6.51	4.3
8.....	Cream.....	1.0051	91.37	.....	25.90	6.76	.....
	Cream sera:						
8.....	Acetic acid.....	1.0281	93.58	.98	.21	6.47	39.4
8.....	Spontaneous....	1.0262	93.91	.95	.04	6.09	21.4
3.....	Rennet.....	1.0272	93.41	1.14	.12	6.55	4.6
8.....	Buttermilk.....	1.0297	91.55	.....	1.25	8.31	.....
	Buttermilk sera:						
8.....	Spontaneous...	1.0264	93.81	.98	.11	6.18	21.5

The serum from the acetic acid curd contained more fat than when the milk was otherwise coagulated. The acidity of the serum spontaneously coagulated at room temperatures was a little lower than that coagulated in an incubator, but the specific gravity was about the same in both cases.

The specific gravity of pasteurized milk serum was also found to be slightly higher than that of the serum of raw milk, but on allowing it to curdle spontaneously the serum of the pasteurized milk was the lower. Pasteurizing lowered the specific gravity of the serum of cream and of buttermilk. The specific gravity of pure serum from mixed milk is never under 1.0260. The ash content of serum spontaneously curdled varies from 0.75 to 0.8 per cent, a smaller percentage indicating watering.

The use of the refractometer is also of service in detecting watered milk. The refractive power of spontaneously curdled serum should not be less than 8 divisions on a Wollny refractometer. Ten per cent of water will lower it one degree. When the blue solution (copper-glycerin-potash) of Baier and Neumann is added to milk and the power of refraction is under 20 scale divisions the milk has been watered.

Experiments on the germicidal action of cow's milk. P. G. Heinemann and T. H. Glenn (*Jour. Infect. Diseases, 5 (1908), No. 5, pp. 534–541, fig. 1, chart 1*).—The authors studied the bacterial content of milk and milk serum obtained by passing milk through a Berkefeld filter. Some of their conclusions are as follows:

"The decrease of bacteria in fresh cow's milk is more decided if fairly large numbers are inoculated than if small numbers only are present.

"The relative increase of bacteria in milk is more pronounced in milk heated to 75° C. or 100° C. than in raw milk or in milk heated to 56° C.

"Milk inoculated with pure cultures of bacteria seems to restrain to a marked degree the multiplication of these bacteria for several hours at 37° C., and for a somewhat longer period at room temperature, excepting in the case of *Strepto-*

coccus lacticus, which increases from the beginning, although it may be inhibited to some extent.

"Heating milk to 56° C. for 30 minutes does not entirely destroy the power to restrain the multiplication of bacteria; this power is weakened however, and at 75° C. is destroyed completely. This fact together with the fact that milk serum agglutinates some species of bacteria in vitro to a marked degree seems to favor the assumption that agglutinins are in part responsible for the apparent decrease of bacteria in fresh milk, since bactericidal substances are destroyed by heating to 56° C. for 30 minutes.

"The agglutination of certain bacteria in milk serum seems to bear some relation to the apparent decrease in numbers of bacteria observed in fresh milk, but this is probably not the only factor causing such reduction."

The bactericidal property of milk, J. S. Evans and T. A. Cope (*Univ. Penn. Med. Bul., 21 (1908), No. 9, pp. 264–274, fig. 1, charts 8*).—The contradictory conclusions of previous investigators on the subject are reviewed, and it is suggested that the varying results may be due to the variation in methods, as none of these investigators employed absolutely sterile milk. The authors obtained sterile milk by drawing milk from the teat with a cannula connected with rubber tubing to a bottle. The following results were obtained:

"*Streptococcus pyogenes.*—At the end of 4 hours the bacterial content of the unheated milk had decreased 3.5 per cent; that of the milk heated to 55° C., 20 per cent; that of the frozen milk 7 per cent; while the pasteurized and sterilized milks had an increase in their bacterial content of 25 per cent and 10 per cent, respectively, the bouillon control increasing 6 per cent. At the end of 8 hours this wide variation in the percentages of increase disappeared. . . .

"*Staphylococcus aureus.*—At the end of 4 hours the number of bacteria in raw milk had decreased about 20 per cent; the milk heated to 100° C. showed an increase of 100 per cent in bacterial content; in that heated to 68° C. there was an increase of between 10 per cent and 20 per cent; in that heated to 55° C. there was found an increase of 4 per cent; while in that frozen there was an increase of 40 per cent. The bacterial increase in the bouillon control was 1 per cent. . . .

"*Bacillus coli communis.*—At the end of 4 hours this organism decreased 40 per cent in the count in raw sterile milk, while it increased 10 per cent, 25 per cent, 100 per cent, and 2,000 per cent, respectively, in the counts in the milk heated at 55° C., the bouillon control, the milk heated at 68° C., and the milk heated at 100° C. At the end of 8 hours the bacterial content increased rapidly, the raw milk, however, showing the smallest ratio of increase. At the end of 24 hours there was very little difference in the percentages of increase in the various specimens. . . .

"*Bacillus acidi lactici.*—At the end of 4 hours this organism showed an increase of 6 per cent, 55 per cent, 250 per cent, 1,000 per cent, 3,500 per cent, and 2,500 per cent, respectively, in the bacterial content of the raw sterile milk, the frozen milk, the milk heated at 55° C., the milk heated at 68° C., the milk heated at 100° C., and the bouillon control. . . .

"*Bacillus subtilis.*—At the end of 4 hours this organism showed an increase of 5.5 per cent, 2.5 per cent, 20 per cent, 85 per cent, 450 per cent, and 60 per cent, respectively, in the bacterial content of the raw sterile milk, the milk heated at 55° C., the frozen milk, the milk heated at 68° C., the milk heated at 100° C., and the bouillon control."

It would seem from these results that freshly drawn milk possesses a bactericidal activity toward certain micro-organisms and an inhibitory activity toward others. This activity is destroyed at 68° C., and materially impaired at 55° C.

Further trials showed that this bacterial activity varied with different cows. It was also found that "coagulation and acidity of milk do not depend solely upon the bacterial content. They are influenced by natural properties of milk which are soon overshadowed by the metabolic products of bacteria." The authors look upon pasteurized or sterilized milk with disfavor, although realizing that at the present time it is a necessity under certain conditions.

Investigation of pasteurized milk, O. GALVAGNO (*Centbl. Bakt.* [*etc.*], *2. Abt., 21 (1908), No. 20–21, pp. 632–647; abs. in Milchw. Zentbl., 5 (1909), No. 1, pp. 35, 36*).—The work of other investigators concerning the efficiency of pasteurizing as a method of destroying bacteria is reviewed. The author made many tests to determine the value of different reagents for testing milk at different temperatures. Arnold's tincture of guaiac method gave an immediate reaction at 25° C. Above or below that temperature the reaction was slower. Schardinger's methylene blue and formalin method is reliable but depends upon many factors besides temperature. The Neisser-Wechsberg method is reliable but requires a much longer time than the Schardinger method. Storch's paraphenylendiamin method gives an immediate reaction in raw milk and in milk heated to 70°, but is negative at temperatures above 79°. Saul's orthol reaction was immediate up to 70°, was retarded at 74°, and negative at 78°. An amid potassium iodid solution, to which a drop of hydrogen peroxid was added, gave an immediate reaction up to 70°, but at higher temperatures it was retarded, and 2 or more drops of hydrogen peroxid also delayed the reaction. The magnesium sulphate method proved worthless.

These tests were also used in samples that had been kept 6 days, raw milk and milk heated to 65° C. being kept on ice and at ordinary room temperature. The preservation of the sample made little difference in the Storch or the amid potassium iodid-hydrogen peroxid methods. The guaiac reaction was retarded. The Saul method reacted as when the sample was fresh up to the fourth day, after which the reaction was slower. The Schardinger method was unaffected until the third day, when the reaction was retarded in both the milks kept on ice, and accelerated with the milk heated at 65° and kept at room temperature. On the fourth day the reaction was accelerated in all cases except with the raw milk kept on ice. On the fifth day the reaction was the same in all cases as on the fourth day, except that the reaction with the milk heated at 65° was accelerated. On the sixth day in all cases the reaction was accelerated.

On the therapeutic action of fermented milk, C. A. HERTER (*Pop. Sci. Mo., 74 (1909), No. 1, pp. 31–42*).—A critical discussion on the therapeutic value of fermented milks of various kinds, especially milk fermented by *Bacillus bulgaricus*. Many physicians report favorable results from the use of milk that has undergone lactic-acid fermentation, but little is known as to the nature of its action. By some it is thought that the beneficial results are due to the antiputrefactive action of lactic acid. The reduction of the carbohydrates to lactic acid and a change from a food containing a large protein content will decrease the amount of putrefiable material, but accurate data as to any direct action on the part of *B. bulgaricus* is wanting. See also a previous note (E. S. R., 20, p. 496).

The effect of hydrogen peroxid on tuberculous milk, A. MONVOISIN (*Rev. Gén. Lait, 7 (1908), Nos. 4, pp. 73–80; 5, pp. 97–101*).—Guinea pigs were inoculated with milk treated with hydrogen peroxid by the method of Much and Römer (E. S. R., 18, p. 368). The results agreed with those of Bergmann and Hultman, that tuberculous germs are not always killed by sterilizing in this way. Bacilli taken from young cultures were thus destroyed, but from older cultures they were more resistant.

Investigations on the influence of salt on the bacteria, yeasts, and fungi of butter, O. Fettick (*Centbl. Bakt. [etc.], 2. Abt., 22 (1908), No. 1–3, pp. 32–44*).—The initial flora of unsalted butter consist chiefly of bacteria and yeasts, but these begin to decrease in number in about 2 months. At first fungi are present only in small numbers, but gradually increase for several months. In salted butter the fungi disappear in 3 months. The number of bacteria and yeasts begin to diminish in the third month.

The influence of saltpeter on the quality of cheese, A. Wolff and F. M. Berberich (*Molk. Ztg., 22 (1908), No. 52, pp. 1487, 1488*).—Saltpeter is sometimes used to prevent cheese inflation. The authors added 20 gm. of saltpeter to 100 liters of milk. For a time the cheese was normal, but after 6 weeks cracks appeared. The aroma and quality of the cheese was good except a slight yeastlike odor near the cracks. A bacteriological examination of the saltpeter revealed large numbers of cocci and a few yeasts. It is suggested that many common faults of butter and cheese may be due to bacteria contained in the salt. To prevent infection from this source the salt used in the manufacture of dairy products should be bacteriologically as well as chemically pure and should be kept in closed receptacles.

Cracks in Cheddar [cheese] (*N. Y. Produce Rev. and Amer. Cream., 27 (1908), No. 9, pp. 384, 385*).—A symposium on this subject by practical cheese makers. The principal causes of cracking are: (1) too much acid; (2) too dry an atmosphere; (3) drafts blowing directly on the cheese; (4) too much fat in the curd; (5) insufficient pressure; (6) dirty, greasy, or sour hoops and bandages; (7) careless carrying of the cheese to the press; (8) allowing the curd to get too cold; (9) extreme heat in the curing room; and (10) too much or too little salt.

Concerning pear tannin and the changes it undergoes in fruit wine making, W. Kelhofer (*Landw. Jahrb. Schweiz., 22 (1908), No. 7, pp. 343–410, pls. 4, figs. 5, dgm. 1*).—The author reports the results of an extended study of the preparation of pear tannin, its physical and chemical characteristics in comparison with other similar bodies, and the discovery of this tannin in must, with special reference to the making of fruit wine.

Mannitic fermentation in fruit and grape wines, W. Bierberg (*Mitt. Weinbau u. Kellerw., 1908, No. 7, pp. 109–112*).—Mannite occurs in many fruits, but usually does not ferment in temperate climates unless the customary fermentations are checked. It occurs more frequently in overripe fruits containing a small amount of acid. To prevent this undesirable fermentation, fruits containing little acid should be harvested early or mixed with more acid fruit. The customary fermentation may be hastened by adding yeast and by regulating the temperature.

Investigations on wine making with sterilized must, A. Rosenstiehl (*Chem. Ztg., 32 (1908), No. 69, pp. 814, 815*).—The author finds that the characteristics of wine are to a large extent independent of the pure yeasts used in fermentation.

The participation of yeasts and the variety of grapes in the formation of the bouquet of wine, A. Rosenstiehl (*Chem. Ztg., 32 (1908), No. 73, pp. 865, 866; abs. in Ztschr. Angew. Chem., 21 (1908), No. 48, p. 2467*).—The nature of the bouquet depends upon the variety of grape, but its strength and development upon the ferment. Some ferments produce no bouquet, while others possess the power to some extent (anthogenous ferments). Musts contain a substance (anthophor) which varies with the variety of grape. Anthophor exists in the plant in an equal amount whether or not the grapes are ripened in the best situation. The ferment, on the contrary, which develops the anthophor is present only when ripened in the best situation.

With our present knowledge, the best results in practice are obtained by sterilizing the grape juice and fermenting with anthogenous yeasts at as low a temperature as 20° C. if possible.

The oil trade at Marseille (*Chem. and Drug., 73 (1908), No. 1503, p. 770; Jour. Soc. Chem. Indus., 27 (1908), No. 22, p. 1120*).—Marseille now produces an average of 420,000 tons per annum of oil and oil cake from vegetable substances. This output includes oils obtained from the olive, peanut, beechnut, cotton seed, palm, karite, coconut, and castor bean, coco butter, Chinese vegetable lard, and various mixtures sold as salad oils.

Rock salt [in Louisiana], G. D. Harris, C. J. Maury, and L. Reinecke (*Geol. Survey La. Bul. 7, pp. XI+259, pls. 48, figs. 21*).—The investigations reported in this bulletin were made under the direction of the Louisiana Experiment Stations. The report deals with the origin, geological occurrence, and economic importance of rock salt deposits in Louisiana and also contains brief notes and references to all known salt deposits and industries of the world.

VETERINARY MEDICINE.

The systematic relationships of the Coccaceæ with a discussion of the principles of bacterial classification, C. E. A. and Anne R. Winslow (*New York and London, 1908, pp. VIII+300, pl. 1, figs. 3; rev. in Science, n. ser., 29 (1909), No. 740, p. 387*).—This book is stated to be the outgrowth of an attempt to classify certain bacteria of sanitary importance, belonging to the family Coccaceæ. An effort was made to discover natural types among the Coccaceæ by a study of the numerical frequence with which various characters occur. From various sources 500 different strains of Coccaceæ were isolated and submitted to 11 definite and quantitative tests. The results were analyzed with a view to the centers about which each character varied in the series as a whole, and to the general correlation between different characters.

The authors conclude that bacterial groups can be defined, and can only be defined by a study of the numerical frequence of various characters in a large series of cultures. In the Coccaceæ, "two main series, or subfamilies, may be distinguished—one primarily parasitic and the other saprophytic. The groups differ in morphology, staining reactions, cultural characters, and biochemical powers. Within these 2 subfamilies are 8 minor groups which seem to merit generic rank. Each is marked by the correlation of several apparently independent characters, and the eight form, in general, a more or less linear series, connecting such purely parasitic forms as the meningococcus with the saprophytic cocci, so common in the air. Within each genus are included 3 or 4 distinct specific types, each marked by a single peculiarity but sharing the common characters of the genus as a whole. Species and genera alike are connected by numerous intergrading varieties; but the central types in each case are defined by the preponderating frequency of their occurrence."

A key to the genera and species of the Coccaceæ and a bibliography are appended.

Practical bacteriolcgy, blood work, and animal parasitology, E. R. Stitt (*Philadelphia, 1909, pp. XI+294, pls. 4, figs. 82*).—In this manual, part 1 is devoted to bacteriology, part 2 to the study of the blood, part 3 to animal parasitology, and part 4 to clinical bacteriology and animal parasitology of the various body fluids and organs. In an appendix are given methods of preparation of microscopic sections, directions for mounting and preserving animal parasites, the preparation of normal solutions, and data regarding diseases of unknown etiology.

Contribution to the study of the bacterial flora of eggs, A. Chrétien (*Hyg. Viande et Lait, 2 (1908), No. 6, pp. 247–254*).—The author examined spotted eggs and found them to contain bacteria of the genera Pasteurella, Bacterium, Sarcina, and Staphylococcus.

Researches on the pathogenic anaerobes, E. von Hibler (*Untersuchungen über die pathogenen Anaëroben. Jena, 1908, pp. 438, pls. 17, rev. in Brit. Med. Jour., 1909, No. 2514, p. 604*).—This volume deals with 15 species, including the bacillus of symptomatic anthrax, varieties of bacilli of malignant edema, the tetanus bacillus, and bacilli associated with epidemics of meat poisoning. The cultural characters of these various micro-organisms and diagnostic points of difference are considered in the first part of the book. Data regarding the pathogenicity of the anaerobes and the anatomical and histological character of the lesions produced make up the remainder of the volume.

The ultravisible viruses, J. M'Fadyean (*Jour. Compar. Path. and Ther., 21 (1908), Nos. 1, pp. 58–68, fig. 1; 2, pp. 168–175; 3, pp. 232–242*).—The author considers the ultravisible viruses at length. Attention is first called to the fact that the virus of contagious bovine pleuro-pneumonia is on the border limit of visibility, since it can just be made out with a magnification of 2,000 and a brilliant illumination. The mosaic or spotted disease of the tobacco plant appears to have been the first disease whose cause was proved to be of the nature of an ultravisible virus. Foot-and-mouth disease is the first animal disease shown to be due to an ultravisible virus, an account of which discovery was published in 1898. African horse sickness, fowl plague, yellow fever, cattle plague, sheep pox, epithelioma contagiosum of birds, hog cholera, rabies, cow pox, equine pernicious anemia, canine distemper, blue tongue, and leucocythemia in fowls are the other diseases known to be due to ultravisible viruses, and here considered.

Immune sera, C. F. Bolduan (*New York and London, 1908, 3. ed., enl., pp. VIII+176, figs. 10*).—A third and enlarged edition of this work, which is a concise exposition of our present knowledge concerning the constitution and mode of action of antitoxins, agglutinins, hemolysins, bacteriolysins, precipitins, cytotoxins, and opsonins.

Some examples of malignant disease in animals, J. B. Cleland (*Jour. Compar. Path. and Ther., 21 (1908), No. 3, pp. 242–245, fig. 2*).—The author presents an account of cancerous conditions that have been met with during the past 2 years in western Australia, which he considers of interest particularly as showing the widespread distribution of such diseases. These include carcinoma of the breast of a lioness, carcinoma of the udder in a dairy cow, squamous epithelioma of the perinæum of a cow, epithelioma displacing the eye of a horse, epithelioma growing from the conjunctival surface of the lower eyelid of a horse and displacing the globe, alveola sarcoma of the mediastinum in a bullock, and a malignant disease (carcinoma) of the suprarenal gland of a sheep.

Veterinary division, A. Grist (*Dept. Agr. Orange River Colony, Ann. Rpt., 4 (1907–8), pp. 77–90*).—Glanders is reported as greatly decreased in prevalence during the year under report. A single case of pleuro-pneumonia is said to remain from the outbreaks resulting from its introduction in 1907 from Cape Colony. Although East Coast fever has not yet extended to Orange River Colony, its spread is causing the department much anxiety. Hog cholera has not as yet been reported from the colony. Quarter evil is said to be very prevalent during certain portions of the year, and geil-ziekte as prevalent in the spring. Some 7,000 sheep were vaccinated against blue-tongue during the year with Theiler's preventive vaccine with satisfactory results. Other diseases mentioned as having occurred during the year include anthrax, ulcerative

lymphangitis, scabies, ephemeral fever, geel dikkop, white scour in calves, and jag-ziekte.

Experiments regarding the diagnosis of anthrax, G. Mazzini (*Arch. Sci. R. Soc. Accad. Vet. Ital., 5 (1907), No. 7–8; Jour. Trop. Vet. Sci., 3 (1908), No. 2, pp. 207–216*).—The author concludes that "(1) the material should be collected from the animal before advanced putrefaction occurs, preferably not later than 24 hours after death in the summer; (2) the method of Heim, with threads, or that of Fischoeder with 2–3 mm. of blood is the best, because putrefaction is thus arrested or impeded; (3) the cultural test is made by sowing a piece of thread saturated with spleen juice on agar; (4) the biological proof on the guinea pig is less reliable on account of the presence of extraneous organisms; and (5) the failure of both these above tests does not exclude anthrax. Heating of the material to 60° C. must be had recourse to."

Vaccination against symptomatic anthrax, E. Leclainche and H. Vallée (*Rev. Gén. Méd. Vét., 11 (1908), No. 131, pp. 625–635; Jour. Compar. Path. and Ther., 21 (1908), No. 3, pp. 264–269*).—The authors conclude that the method of vaccination against blackleg by the use of pure vaccines meets all the requirements of practice. "In infected areas, the combined use of immunizing serum and of a single vaccine enables the practitioner immediately to check the spread of disease and to vaccinate the contaminated animals without danger, even under conditions where vaccination properly so-called would be dangerous and could only confer protection after considerable delay.

"In noninfected areas, double vaccination with pure liquid vaccines is preferable."

The cause, prevention, and treatment of Mediterranean fever, P. W. Bassett-Smith (*Vet. Jour., 64 (1908), No. 394, pp. 174–178*).—This is a historical résumé of recent work on the disease. The author considers the terms "Malta" and "Mediterranean" fever both wrong and misleading, and prefers the term "undulant" fever to "septicemia of Bruce" as lately used.

Experimental study of the fate of tetanus toxin in the digestive canal, H. Vincent (*Ann. Inst. Pasteur, 22 (1908), No. 4, pp. 341–352; abs. in Bul. Inst. Pasteur, 6 (1908), No. 13, pp. 605–607; Centbl. Bakt. [etc.], 1. Abt. Ref., 42 (1908), No. 11–13, pp. 370, 371; Vet. Rec., 21 (1908), No. 1059, p. 260*).—The author has found that the tetanus toxin is destroyed in vivo in the stomach of the guinea pig in less than 1 hour. In the duodenum and large intestine it is destroyed after 2 or 3 hours. It was found that the gastric, biliary, pancreatic, and enteric juices in vivo destroy the toxicity of the tetanus poison. The author interprets this as a phenomenon of digestion, as he finds that the digestive and antitoxic properties of the gastric and pancreatic ferments vary in very much the same way under similar conditions.

A report on trypanosomiasis of domestic stock in northwestern Rhodesia, R. E. Montgomery and A. Kinghorn (*Ann. Trop. Med. and Par., 2 (1908), No. 2, pp. 97–132, pls. 4, map 1*).—The authors conclude that trypanosomiasis of domestic stock is very prevalent in the northern area of northwestern Rhodesia, and that it is due to *Trypanosoma dimorphon*, *T. vivax*, and a trypanosome morphologically allied to *T. brucei*. While *T. theileri* also occurs it does not appear to cause serious damage. These trypanosomes may be transmitted by *Glossina morsitans*, *Stomoxys calcitrans*, and a species of Lyperosia.

Reports of the "sleeping sickness" expedition to the Zambesi for the years 1907–8, A. Kinghorn and R. E. Montgomery (*Ann. Trop. Med. and Par., 2 (1908), No. 2, pp. 53–76*).—Data on the distribution of tsetse flies are included in this report.

A note on the occurrence of a large trypanosome in the blood of native cattle in South China, C. M. Heanley (*Jour. Compar. Path. and Ther., 21*

(*1908*), *No. 2, pp. 178, 179, figs. 4*).—A trypanosome that corresponds in size with *Trypanosoma theileri*, and also has the long flagellum and acutely pointed posterior extremity of that organism, has been taken from cattle at the cattle depot at Hong-Kong.

A peculiar form of streptotrichosis among cattle, J. D. E. Holmes (*Jour. Trop. Vet. Sci., 3* (*1908*), *No. 3, pp. 289–300, pls. 4, figs. 5*).—The author presents a report of a study made of a disease that appeared among army transport bullocks in Calcutta in 1907. The clinical features of the disease are said to bear a resemblance to equine epizootic lymphangitis.

Redwater in England and its carriers, S. Stockman (*Jour. Compar. Path. and Ther., 21* (*1908*), *No. 3, pp. 225–232; Vet. Jour., 64* (*1908*), *No. 401, pp. 538–548, charts 4; Vet. Rec., 21* (*1908*), *No. 1067, pp. 391–401, charts 4*).—This paper is based upon 3 years' investigations of the disease in Great Britain in collaboration with J. McFadyean, a more complete report of which will be published later.

Contrary to reports previously published in the United Kingdom, the author has found the disease to be inoculable in a way similar to the Texas fever type. Only two species of ticks (*Ixodes ricinus* and *Hæmaphysalis punctata*) have been met with in England on cattle and sheep. Each of these species drops for both molts. *I. ricinus* has been found the most often in redwater pastures. *H. punctata* though much more restricted in its distribution than *I. ricinus* is more common in the southeast of England and has been obtained from redwater farms on which *I. ricinus* could not be found.

The few experiments made with *I. ricinus* failed to show that infection passes through the eggs to the seed ticks. Four experiments made with *H. punctata* in which larvæ were engorged upon infected hosts and placed as nymphs upon susceptible hosts all resulted negatively. Similar results were obtained when the larvæ from an infected female were used. In both of two experiments, however, in which nymphs that had engorged on infected hosts were placed as adults upon susceptible hosts, the disease was produced.

The difficulty in destroying the ticks is shown by the fact that the immature stages require but 3 or 4 days to engorge and drop. This habit of dropping for the molts appears to be favorable, however, in that the ticks are not carried far to infect new territory. The author does not consider the number of ticks found on the animal to have any relation to the severity of the attack but considers such to depend upon the virulence of the Piroplasma. The greater prevalence of the disease from May to August is said to correspond to the period in the year at which adults are most numerous. As a prevention of the disease the author recommends that cattle be kept off infected pastures, that such pastures be well stocked with sheep, and that the sheep be dipped or sprayed at intervals of 10 days, particularly during the season at which the adult ticks are in evidence. This recommendation is based upon the fact that 10 days or more are required for the female ticks to engorge.

Investigations on the nature of hog cholera and methods for its control, Uhlenhuth et al. (*Arb. K. Gsndhtsamt., 27* (*1908*), *No. 3, pp. 425–671; abs. in Centbl. Bakt. [etc.], 1. Abt., Ref., 41* (*1908*), *No. 14–16, p. 480; Bul. Inst. Pasteur, 6* (*1908*), *No. 12, p. 565; Rev. Gén. Méd. Vét., 12* (*1908*), *No. 139–140, p. 414*).—The authors have investigated the disease in Germany and corroborated the results obtained by Dorset, Bolton, and McBryde of this Department, and proved the identity of German "schweinepest" with the English swine fever and American hog cholera. The virus was found to pass through Berkefeld, Pukall, and Heim filters.

The disease can not be produced by the injection of filtrates from cultures of *Bacillus suipestifer*, or by filtrates of serum or organ extracts from healthy

animals. *B. suipestifer* is a saprophyte present in the intestines of healthy swine, having been found in the intestinal contents in 51 of 600 normal hogs examined. It was isolated in 76 of 271 examinations made of animals affected with hog cholera. Swine inoculated with *B. suipestifer* were not immune to hog cholera. The ultravisible virus was present in the blood, bile, and urine, the urine of diseased hogs being highly infectious. It does not appear to occur regularly in the feces, as filtrates from the intestinal contents of 4 affected hogs examined, which exhibited extensive intestinal lesions, were not infectious.

The virus retained its virulence for 23 days when kept in the refrigerator and for 10 weeks when kept at room temperature. In serum it resisted heating 2 hours at 58° C., but was destroyed at the end of 1 hour when exposed to a temperature of 78°. The blood continues virulent after 24 hours of refrigeration at —18°. Twenty-four hours drying of the virus at 27° in blood and serum does not destroy it. The limit of resistance appears to be close to 60°. A 0.1 per cent solution of bicholrid of mercury used in the proportion of 1:2 and a 5 per cent solution of carbolized glycerin used in the proportion of 2:5 did not kill the virus in defibrinated blood after 8 days' contact. In buried organs putrefaction destroys the virus in from 1 to 4 weeks. Horses, cattle, donkeys, goats, dogs, cats, fowls, pigeons, rabbits, guinea pigs, wild and tame rats, and gray and white mice are resistant to the virus. The serum from hyperimmunized hogs showed a strong protective power.

The swine plague ("schweineseuche") bacteria found in the lung lesions in the course of hog cholera are considered as constant but harmless organisms of the respiratory passages of healthy pigs and their pathogenicity as due to the diminished resistance in animals affected with hog cholera.

A bibliographical list is appended.

Suggestions for an organized plan to combat hog cholera. A. D. Melvin (*Wallaces' Farmer, 34 (1909), No. 11, p. 385*).—In order that the possibilities of well-directed work may be brought to the attention of those who may in the future have hog cholera to deal with, the author has outlined the following suggestions for combating the disease through serum immunization as worked out by the Bureau of Animal Industry of this Department.

"The serum should be prepared by the State experiment stations or by live stock sanitary boards which are properly equipped with laboratory facilities, the efficacy of all serum to be determined by the laboratories before distribution.

"The field application of the serum should be in the hands of the State live stock sanitary board or State veterinarian.

"The State should be organized into districts, each in charge of a deputy State veterinarian or a deputy appointed by the live stock sanitary board. These districts should be small enough to permit the deputy to exercise close watch over them.

"The deputy State veterinarian should keep a supply of serum on hand to see that prompt action is taken when infection appears.

"Hog raisers generally throughout the State should be informed when this serum is available for distribution, and if necessary compulsory notification of the presence of disease in a herd should be imposed.

"Upon notification to the deputy in charge of the district or the State live stock sanitary board or State veterinarian that hog cholera has appeared in a certain neighborhood the diseased herd or herds should be immediately quarantined, the premises disinfected as thoroughly as possible, and all hogs on the farm which have been exposed or which are not visibly ill should be treated with the serum alone. All hogs on the farm which have not been exposed should be treated by what is termed the serum-simultaneous method, and of course the prompt burning or burial of dead animals should be enforced. At

the same time all hogs on surrounding farms should be treated by the serum-simultaneous method."

Investigations into the hematogenous nephritis of swine, K. DEGEN (*Untersuchungen über die hämatogene Nephritis des Schweines. Inaug. Diss., Univ. Giessen, 1907; rev. in Berlin. Tierärztl. Wchnschr., 1908, No. 31, p. 548; Vet. Rec., 21 (1908), No. 1048, p. 95*).—The disease is not a specific one due to a single micro-organism but to a polybacterial infection. The author estimates that 5 per cent of all swine slaughtered in Dresden are affected.

Infectious anemia of the horse, M. FRANCIS and R. P. MARSTELLER (*Texas Sta. Bul. 119, pp. 3–19, figs. 8, dgm. 1, charts 5*).—This is a preliminary report on the symptoms and post-mortem examinations of a number of horses and mules affected with an obscure wasting disease prevalent in the flat coastal district of Texas and similar to infectious anemia reported from Nebraska, Minnesota, North Dakota, Manitoba, and other localities. Intermittent fevers and emaciation are the conspicuous symptoms of this disease. The author estimates that 80 per cent of the affected animals die within a few weeks.

Inoculation experiments were conducted with a virus obtained in October, 1907, from a horse (No. 1) at Katy, Harris County, a summary of which is here given in tabular form.

Results of inoculation experiments.

Animal.	Infection.		Effect.	Remarks.
	Source.	Form.		
Horse No. 2..	Horse No. 1.	5 cc. of blood subcutaneously, 5 cc. of blood intravenously.	Chronic type ...	Inoculated Oct. 25, 1907; alive Nov. 18, 1908, though very thin.
Horse No. 3..	Horse No. 2.	2 cc. in bouillon intravenously, 1 cc in bouillon subcutaneously.	Died on 51st day.	Virus lived 48 hours at 37° C. before injection.
Horse No. 4..	Horse No. 3.	10 cc. blood serum	Died on 20th day.	Horse killed to end suffering.
Horse No. 5..	Horse No. 2.	2 cc. of blood subcutaneously.	Died on 25th day.	Acute fatal type.
Horse No. 6..	Horse No. 5.	1 cc. of blood subcutaneously.	Died on 153d day.	Slow chronic type.
Mule No. 7 ..	Horse No. 6.	1 cc. of blood subcutaneously.	Chronic type ...	Remained in good physical condition.
Mule No. 8 ..	Mule No. 7..	4 cc. of blood subcutaneously.	.....	
Mule No. 9 ..	Mule No. 7..	4 cc. filtrate subcutaneously.	Died on 44th day.	
Mule No. 10..	Horse No. 2.	.....	Mild reaction ..	Not susceptible.
Horse No. 11.	Horse No. 2.	2 cc. of blood subcutaneously.	Died on 22d day.	Blood obtained from horse No. 2 12½ months after it was inoculated.

A calf, sheep, goat, and pig were inoculated subcutaneously with 1 cc. of blood taken from horse No. 2, and one of each was also inoculated with a similar amount of blood taken from horse No. 5. None of these was susceptible. A dog inoculated subcutaneously with 1 cc. of blood from horse No. 6 was not susceptible.

The infection is thought to be due to an ultravisible organism which can be conveyed to other horses and mules by subcutaneous and intravenous injections of blood. The blood of animals that survived the first attack and regained much of their lost flesh and spirit is as capable of producing the disease one year after primary infection as during the first sickness. It seems probable that the blood remains virulent during the life of the animal affected. Mule No. 7 while susceptible resisted the infection to such a degree as to continue in good health. "This may make the detection and eradication of the disease a

very difficult matter, as mule No. 7 would to-day pass almost everyone as sound while the blood is still infectious." It has been found that while some mules regain much of their flesh and strength when well fed and not worked, almost every horse dies in spite of the best care and attention.

Immunization against glanders, A. Marxer (*Rev. Gén. Méd. Vét., 12 (1908), No. 133, pp. 1–5; abs. in Jour. Compar. Path. and Ther., 21 (1908), No. 3, pp. 269–271*).—An account is given of experiments conducted in association with E. Levy and F. Blumenthal, based upon the idea that vaccines might be prepared by treating the bacteria with solutions of chemical substances which were indifferent to the bacteria but were capable of changing the osmotic pressure and thus enfeebling the bacteria without killing them, without seriously altering their constitution, or without modifying the antigens which are so important in producing immunity.

Glycerin and urea are said to possess such properties. The attenuation of the virus of glanders in solutions of glycerin and urea is said to be proportional to the temperature and inversely proportional to the density of the emulsion. Experiments were first made with the guinea pig, then with the horse. Emulsions containing urea are most useful, as they can readily be evaporated to dryness and reduced to a powder which keeps for a long time, even at comparatively high temperatures. Complete immunity was produced in horses by a single injection of 600 mg. of dead bacilli or 2 injections of 300 mg. each of dead bacilli with urea. The immunity conferred lasts at least a year.

In practice it is convenient to inject under the skin a dose of 100 mg. of the immunizing powder, followed at intervals of a week by doses of 200 and 250 mg.

The mallein reaction in nonglandered horses, H. J. Südmersen (*Vet. Jour., 64 (1908), No. 394, pp. 197, 198*).—"Immune horses rarely give any rise in temperature (3 cases in 50), and when such a rise does take place the maximum is reached at 12 hours after injection and the temperature rapidly falls and reaches the normal in about 24 hours."

The author's experience with glandered horses has been that the maximum temperature is not reached until the fifteenth hour and the fall is only gradual. "Out of 26 horses with large local reactions, and which were shown to be glandered on post-mortem examination, 19 had considerable increase in temperature (average rise 2.7° F.) while 7 gave very little rise (average 1.1° F.). The local reaction obtained upon immune horses also differs from that of glandered animals."

Preventive vaccination against strangles, F. S. H. Baldrey (*Jour. Compar. Path. and Ther., 21 (1908), No. 2, pp. 158–162*).—"As a result of these experiments it would appear that subcutaneous vaccination with either a broth culture killed under tolnol, or an agar culture in salt solution killed at a temperature of 58° C., will have a very considerable effect in raising an animal's resistance to a streptococcic infection, and is therefore useful as a preventive to the disease. Control animals will show a more or less severe abscess when tested with a nonlethal dose of strangles streptococcus culture, whereas the vaccinated animal will suffer practically no ill effects."

Investigation of an outbreak of horse surra with result of treatment with atoxyl, tartar emetic, mercury, and other drugs, J. D. E. Holmes (*Jour. Trop. Vet. Sci., 3 (1908), No. 2, pp. 157–172, pls. 2*).—The author reports an outbreak of surra in India in 1907 and the results obtained from treatment with atoxyl, mercury, and tartar emetic.

Continuation of experiments on protective inoculation against equine piroplasmosis, A. Theiler (*Jour. Compar. Path. and Ther., 21 (1908), No. 2, pp. 97–148*).—The experiments, which are here reported in detail, have been

continued on a somewhat different line from previous ones, as a result of the observation, made in connection with Texas fever, that the inoculation of cattle with blood of a calf immune from the disease is not so frequently followed by strong reactions and mortality as when the blood is derived from a full-grown animal.

"The inoculation of animals with horse foal blood of the first, second, and third generations caused a mortality of 6 out of 186, or 3 per cent.

"The inoculation of animals with horse foal blood of the fourth, fifth, sixth, seventh, and eighth generations caused a mortality of 1 in 22, or 4.5 per cent.

"The inoculation of animals with donkey foal blood of second to sixth generations caused no mortality amongst 173 animals.

"The reactions caused by injection of horse foal blood were more severe than those given by injection of donkey foal blood.

"No cases of relapses after discharge have occurred, proving that the immunity given by the injection of donkey foal blood is as good as that afforded by horse foal blood.

"For further immunization purposes, therefore, I recommend the passing of blood originating from a natural infection of a donkey with *Piroplasma equi* through donkey foals, and to use 1 cc. blood from the fourth generation and upwards, bearing in mind the precautionary measures mentioned above.

"Finally, all foals kept for tapping purposes, and used in connection with the inoculation, must be kept free from ticks. This precaution has been carried out at this laboratory with all foals used in the experiments, as it stands to reason that a reinfection by means of ticks would increase the virulency of the blood which is to be used as vaccine."

Typhoid fever of the horse—a piroplasmosis, A. Pricolo (*Vet. Jour., 64 (1908), No. 400, pp. 490–494, fig. 1*).—The author presents an account of the disease produced by *Piroplasma equi*. According to the author's experience and to the statistics of the Italian war department, this disease is spread over all Italy, including Sicily and Sardinia, but seems to be localized in centers from which it has little tendency to spread. The disease may be conveyed by injections of blood of diseased horses into healthy susceptible ones.

"The morphological characters of the parasite, its manner of reproduction, transmission of the disease by injection of the blood, clinical features, and post-mortem appearances show that Italian equine piroplasmosis is identical with equine piroplasmosis described by Theiler in South Africa, and generally with all equine piroplasmosis found in Africa and Asia."

A résumé of our knowledge of canine piroplasmosis with an outbreak amongst the hounds of the Madras hunt, H. T. Pease and W. D. Gunn (*Jour. Trop. Vet. Sci., 3 (1908), No. 2, pp. 175–190, pl. 1, charts 4*).—Following a review of the present knowledge of malignant jaundice of dogs the author reports an outbreak of the disease in Madras hounds. Temperature charts are presented.

Acariasis as found in the transport animals employed on field service Barry (*Vet. Jour., 64 (1908), No. 396, pp. 280–294, figs. 8*).—Next to the horse the camel is considered the most important animal of transport affected, acariasis being very prevalent among them. Mules are frequently used on field service, but in the author's opinion are less subject to scabies. The ass, sometimes used for pack purposes, though receiving little or no care is not affected to any extent, and when affected it is usually with the psoroptic acariasis.

On the prophylaxis of trypanosomiasis, with particular reference to the influence of the camel in India, R. E. Montgomery (*Jour. Trop. Vet. Sci., 3 (1908), No. 3, pp. 301–329*).—The author discusses this subject at some length. Attention is called to the fact that the basis of trypanosomiasis prophylaxis is

the prevention or union between the three essential factors—the reservoir, the transmitting agent, and the receptive host, a combination of any two to the absolute exclusion of the third being harmless.

Concerning certain parasitic protozoa observed in Africa, J. E. Dutton, J. L. Todd, and E. N. Tobey (*Pt. 1, Liverpool School Trop. Med. Mem. 21, 1906, pp. 87–97, pls. 2, fig. 1; pt. 2, Ann. Trop. Med. and Par., 1 (1907), No. 3, pp. 287–370, pls. 13, figs. 35*).—Protozoal parasites of mammals, birds, reptiles, amphibians, fishes, and arthropods are here considered.

On some parasites in the museum of the school of tropical medicine, Liverpool, A. Looss (*Ann. Trop. Med. and Par., 1 (1907), No. 1, pp. 123–154, pls. 3*).—Eight species of endoparasites, one of which is new, are considered in this account.

The presence of Spirochæta duttoni in the ova of Ornithodoros moubata, R. M. Carter (*Ann. Trop. Med. and Par., 1 (1907), No. 1, pp. 157–160, pl. 1*).—The author concludes that ticks infected by spirochetes lay infected eggs, that multiplication of the spirochetes probably takes place in the eggs, and that morphological changes in the spirochetes also occur in the eggs.

On the morphology and life history of Spirochæta duttoni, A. Breinl (*Ann. Trop. Med. and Par., 1 (1907), No. 3, pp. 435–438, pl. 1*).—"The life history of the spirochete might be thus summarized: Just before the crisis the spirochetes disintegrate, certain of them coiling up into skeins, the majority of which are phagocytosed by the spleen. Some of them become encysted and break up into very small bodies, out of which the new generation of spirochetes is evolved."

Contribution to the study of the Porocephalus moniliformis, A. Broden and J. Rodhain (*Ann. Trop. Med. and Par., 1 (1908), No. 4, pp. 493–504, pl. 1*).—Observations on the occurrence of this parasite at Leopoldville, in Kongo Free State, are here reported. A description is presented of the larvæ.

RURAL ENGINEERING.

Irrigation in the Sacramento Valley, California, S. Fortier et al. (*U. S. Dept. Agr., Office Expt. Stas. Bul. 207, pp. 99, pl. 1, figs. 24*).—The investigations reported in this bulletin include a study of the present status of irrigation in the Sacramento Valley, its advantages, possibilities, methods, and costs. That this valley has not shared in the wonderful development which has taken place in other fertile valleys of the arid region is believed to be due largely to two conditions which have retarded the introduction of irrigation. First, that the climate permits grain and hay to be grown in the winter months and matured in the spring; and second, that the size of the majority of holdings is large. In 1907 less than 1 per cent of the arable land was irrigated.

Regarding the general development of the valley through irrigation, the authors believe that three operations are involved, namely: (1) Protective works to control floods, estimated to cost $24,000,000; (2) providing a water supply for irrigation, $50,000,000; and (3) preparing the land for irrigation, $35,000,000. In this connection the introductory chapter of the bulletin gives a review of the present agricultural situation, in which are discussed early efforts at development, soil, climate, overflow conditions, etc., and the general status of irrigation development.

The method followed in the investigations was to make detailed studies of representative localities and general observations of the remainder of the territory. The localities selected were the lands irrigated under the Yolo County Consolidated Water System, Yolo County, under the Central Canal in Glenn and Colusa counties, under the Butte County Canal in Butte and Sutter counties,

and along Stony Creek in the vicinity of Orland. The report of these investigations includes a brief description of the chief features, followed by "an investigation of the various subjects pertaining to the use of water in irrigation, embracing the conveyance of water and its delivery to users, character of water rights, and cost of water, seepage, and evaporation losses both in the channels and on the fields, duty of water under main canals and laterals and on individual farms, proper methods of preparing the land, methods of applying water, ascertaining the right time to irrigate, the removal of waste water, irrigated products, etc."

In connection with the investigations along Stony Creek there were conducted eight experiments to determine the amount of water used by farmers under usual conditions. In five of these experiments devoted to alfalfa an area of 67.9 acres yielded under irrigation an average of 5.38 tons per acre for the season at an average cost of $1.78 per ton. The net depth of water applied as averaged for four of these and one other alfalfa experiment was 4.15 feet, this being the difference between the quantity entering the field and that wasted. In an experiment with lemons the net depth applied was 1.76 feet. The results of the experiments led to the conclusion that an unnecessary amount of water was used on the crops, and he gives at the end of the bulletin a few suggestions regarding the economical use of water.

The hydrologic station of Abbeville, P. HOULLIER and H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 26 (1908), No. 6, pp. 427–444, figs. 2*).—An account is given of the equipment and work of this station, which is connected with a beet-sugar factory of Abbeville. The station was established to study the relation between rainfall, evaporation, transpiration, and drainage, particularly with reference to the water requirements of the sugar beet. It is equipped with rain gauges, evaporometers, vegetation cases, and other appliances necessary for exact measurements of rainfall, drainage, evaporation, and transpiration. The results of studies during 1906, 1907, and 1908 on evaporation from fallow soil and from soil planted to sugar beets are reported, as well as of a study of the amount of water required for the growth of sugar beets.

Earth roads, A. R. HIRST (*Wis. Geol. and Nat. Hist. Survey Road Pamphlet 1, pp. 32, figs. 13*).—This is the first of a series of pamphlets issued by the Wisconsin Geological and Natural History Survey on the subject of roads. It is intended to give in a brief form the best methods of earth road construction, and to point out how to obtain the best results for the amount expended.

The earth road drag, A. R. HIRST (*Wis. Geol. and Nat. Hist. Survey Road Pamphlet 2, pp. 24, figs. 4*).—The object and benefits of road dragging are discussed here, with an explanation of the proper construction and use of the drag. The material is largely compiled from reports of the Illinois State Highway Commission, and from a bulletin on rural highways issued by the Survey.

Stone and gravel roads, A. R. HIRST (*Wis. Geol. and Nat. Hist. Survey Road Pamphlet 3, pp. 32, figs. 12*).—This is the third of the series noted above and considers briefly the main points to be observed in stone and gravel road construction. There are described and illustrated the approved practices in stone road construction, but it is stated that the bulletin should be considered more in the nature of a preliminary guide to prospective road builders than as a treatise.

Culverts and bridges, A. R. HIRST (*Wis. Geol. and Nat. Hist. Survey Road Pamphlet 4, pp. 54, pl. 1, figs. 15*).—The design and construction of culverts, with particular reference to the materials used, is taken up quite fully in this pamphlet, and directions for making concrete culverts are given in detail.

The subject of bridges is treated in a general way, with illustrations and descriptions of types in use and suggestions to communities regarding the selection of the most suitable kind. The material on bridges, it is stated, is largely taken from a report of the Illinois State Highway Commission.

Implements and machinery at the Smithfield Show (*Impl. and Mach. Rev., 34 (1909), No. 405, pp. 1098–1134, figs. 29*).—In this report there are briefly described several new steam traction and portable explosive engines as well as numerous farm machines and implements.

Trials with seed drills and cultivators, C. V. Birk (*Tidsskr. Landökonomi, 1908, No. 5, pp. 289–298*).—Three 2-row seed drills and 17 different cultivators were included in these trials and were judged by the committee on trials of farm machinery of the Royal Agricultural Society of Denmark.

Water aspirators for homes, T. H. Norton (*Mo. Cons. and Trade Rpts. [U. S.], 1909, No. 3/0, pp. 208–210*).—According to data summarized by the author, an ordinary laboratory suction pump may be used with rubber tubing for dusting and cleaning in the home.

Practical paint tests in 1907, E. F. Ladd (*North Dakota Sta. Bul. 81, pp. 577–714, figs. 11*).—There is given in this bulletin an account of painting tests which were carried out in continuation of work previously reported (E. S. R., 18, p. 209). Tests were made with specially prepared paints furnished by the Paint Manufacturers Association of the United States, and considered to be representative of manufacturers' formulas, and also with commercial white lead submitted by the manufacturers. The paints comprised the whites, warm drabs, and yellows of 18 different formulas.

The paints and leads were applied in various manners to fences made of four types of lumber and so constructed as to give a wide range of conditions.

The substance of the bulletin is made up of detailed reports of these tests, covering formulas, directions for application, and data concerning the areas covered and the weight of paint used. The results are given of examinations which were made of the fences at periods of 6 months and 1 year, and of the condition of the paints after standing for about 8 months in the can.

Tests were also made on a number of houses with practically the same paints as used on the fences, and these are described.

RURAL ECONOMICS.

Report of the Country Life Commission, L. H. Bailey et al. (*U. S. Senate, 60. Cong., 2. Session, Doc. 705, pp. 65*).—This includes a special message from the President of the United States transmitting the report to Congress, and an account of the purpose and methods of the commission in their inquiries into the economic and social conditions surrounding rural life at the present time.

In addition to a general statement, the report discusses the main special deficiencies in country life, as disregard of the inherent rights of land workers, highways, soil depletion and its effects, agricultural labor, health in the open country, and woman's work on the farm. According to the commission, the general corrective forces that should be set in motion are along the line of agricultural or country life surveys, a redirected education, cooperative effort, the country church, and personal ideals and local leadership. The report has also been discussed editorially (E. S. R., 20, p. 601).

Rural conditions in Maine, T. J. Lyons (*Ann. Rpt. Bur. Indus. and Labor Statis. Me., 22 (1908), pp. 84–299*).—This article sets forth the rural conditions in every county and township in the State, the data being compiled by the labor commissioner from the replies to a circular letter of inquiry sent to representative farmers. Special topics also discussed are the agricultural resources of

Maine, abandoned farms, farm labor and immigration with accounts of the Finn colonies near West Paris and in South Thomaston, population of towns and rural districts, farm wages, and loss in rural population.

The average monthly farm wages in Maine in 1907 was $26.14, a gain of 42 per cent since 1887. With regard to the rural population, the decrease "has not been so marked in the last 8 years as is shown by the census figures from 1860 to 1900."

Farming west of the 100th meridian. JAMES WILSON (*Breeder's Gaz., 54 (1908), No. 12, pp. 1215, 1216*).—This is a description by the Secretary of Agriculture of the work of this Department in soil surveys, the introduction and culture of crops, the conservation of soil moisture, and the utilization of the natural resources of the semiarid or dry lands of the Great Plains region.

Agriculture in the Po Valley (*Economist, 68 (1909), No. 3418, p. 455*).—This is a review of S. Pugliese's book on Two Centuries of Agriculture in the Vercellese District of the Po Valley. The book treats of the economic conditions among the laboring classes in the district, system of agriculture practiced, changes in labor conditions during two centuries, systems of land tenure, rents, contracts, prices, and women's wages.

Agriculture in Bavaria according to the latest statistics, ZAHNBRECHER (*Vrtljschr. Bayer. Landw. Rat., 13 (1908), No. 4, pp. 387–397*).—This is a comparative study of the Bavarian census figures of 1882, 1895, and 1907, with special reference to the agricultural population. The percentages of the whole population engaged in agriculture in these years were 50.9, 45.8, and 40.3, respectively. The independent farmers in 1882 numbered 406,007 and in 1907 435,421, a relative decrease, when compared with the increase of population, of 1.4 per cent. The number of farm laborers increased from 1,097,267 in 1882 to 1,257,516 in 1907, a relative increase of 1.3 per cent.

[Land occupation, live stock, and agriculture in New Zealand], E. J. VON DADELSZEN (*New Zeal. Off. Yearbook 1908, pp. 468–495*).—Statistical returns in 1908 are presented and discussed. Of 73,367 holdings, 21,186 ranged from 1 to 10 acres in size, 12,147 from 10 to 50 acres, and 10,098 from 100 to 200 acres, the last alone being a decrease over 1907 (E. S. R., 19, p. 1089).

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 11 (1909), No. 4, pp. 25–28*).—Statistical data on the condition of crops in the United States and foreign countries, the condition and losses of farm animals, and the value and prices of agricultural products are reported.

Scientific investigation and its relation to practical farm work, E. J. JAMES (*Breeder's Gaz., 54 (1908), No. 12, pp. 1191, 1192*).—The importance of science in promoting the progress of agriculture and national welfare by investigations on soils, the culture and adaptation of crops, the prevention of animal diseases, the invention of agricultural machinery, and the use of electricity on farms is discussed in this article.

The problem of farm returns, A. OSTERMAYER (*Wiener Landw. Ztg., 58 (1908), No. 98, pp. 961–964*).—The data as to the returns from 10 different-size farms in the district of Mähren are discussed and compared with similar data from 29 other farms in the same section of country for the purpose of determining the system of farm management that will give the best returns to capital and labor.

The supply of farm labor, G. K. HOLMES (*Ann. Amer. Acad. Polit. and Soc. Sci., 33 (1909), No. 2, pp. 362–372*).—This article is an analysis of the situation concerning the supply and character of farm labor in the United States, with suggestions as to the best means of conserving, increasing, and improving farm labor. These means include retaining the children on the farm, the farmers' institute movement, practical demonstration work among farmers by experts

from this Department and the State experiment stations, the development of agricultural education, and the agencies which are at work to improve the dwellings of country people, their modes of living, their home life, and their social life. These influences, it is believed, "may be depended upon to save to our agriculture all the labor it will need for the maintenance of our national self-sufficiency."

A history of the English agricultural laborer, W. HASBACH (*London, 1908, pp. XVI+470; rev. in Economist, 68 (1909), No. 3412, Sup., pp. V, VI; Jour. Roy. Statis. Soc., 71 (1908), No. 4, pp. 722–725*).—A history of the agrarian problem in England to the year 1907, with particular reference to the development of the agricultural proletariat during the past two centuries.

The breaking of contracts by agricultural laborers, F. MENDELSON (*Landw. Wchnschr. Sachsen, 11 (1909), Nos. 11, pp. 115–117; 12, pp. 127, 128*).—Statistics are presented and discussed regarding the prevalence of contract breaking among different classes of agricultural laborers in Saxony, the data being confined largely to the years 1907 and 1908.

Free agricultural employment agencies in Sweden, W. MÜLLER (*Illus. Landw. Ztg., 28 (1908), No. 93, pp. 799, 800*).—The author describes the operation of the free employment agencies that have been established in ten of the chief cities of Sweden since 1902. Their chief value lies in locating on farms the unemployed in cities, particularly those persons who had left farms to seek employment in the cities. A great number of laborers have already been won back to farm life, and the extension of the agencies throughout Sweden is urged in behalf of agriculture and the national welfare.

State assistance to agriculture in Switzerland, L. VON HENNET (*Mitt. Fachberichterstat. K. K. Ackerb. Min. [Vienna], 1909, No. 4, pp. 25–28; Jour. Bd. Agr. [London], 15 (1909), No. 11, pp. 864, 865*).—The law of 1893 for the promotion of agriculture is discussed. Subsidies under its provision are now granted for the following lines of work: Agricultural instruction, establishments for research and experiments, improvement and insurance of cattle, soil improvement by drainage and irrigation, measures against plant diseases, and insurance against hail, and for agricultural societies and syndicates.

The encouragement of agriculture [in Switzerland]. Mutual aid and agricultural education (*Bul. Mens. Off. Renseig. Agr. [Paris], 8 (1909), No. 1, pp. 55–64*).—Notes are given on the different forces in operation for the promotion of agriculture. These include the state inspection of plants and animals offered for sale, federal and state assistance for various undertakings, and agricultural associations, expositions, legislation, and education.

Data are presented regarding the date of origin, organization, membership, and state financial aid to the more important agricultural societies in Switzerland.

The union of Swiss peasants (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 12, pp. 1559–1562*).—This society was organized in 1898 and has for its object the furtherance of agricultural interests in Switzerland. In 1907 the organization had more than 98,000 members and published two monthly journals. One of its chief economic inquiries has related to the determination of the profitableness of agriculture in Switzerland, accounts of which have already been noted (E. S. R., 19, p. 691; 20, p. 587).

Concerning the establishment of a central agricultural credit bank, V. CAMANNI (*Bol. Quind. Soc. Agr. Ital., 14 (1909), No. 1, pp. 10–12*).—The author favors the establishment in Italy under state supervision of a central bank serving both public and private ends, but with particular reference to the furnishing of credit to agriculturists.

Report on the working of cooperative credit societies in the Punjab for the year ending June 30, 1908, S. WILBERFORCE (*Rpt. Work. Coop. Credit Soc.*

Punjab, 1908, pp. 14+XI).—The number of rural mutual credit societies increased during the year from 174 to 253 and the surplus was 53,864 rupees (about $17,450), or twice as large as in July, 1907 (E. S. R., 20, p. 390). The rate of interest charged by the societies is less than 10 per cent, while private money lenders charge 25 per cent or more.

AGRICULTURAL EDUCATION.

The college of agriculture and the State. L. H. Bailey ([*Ithaca, N. Y.*], *1909, pp. 36*).—A notable address on the functions of a State agricultural college, delivered during Farmers' Week at Cornell University, February 26, 1909, and intended to be preliminary to a State campaign for rural progress to supplement the work of the National Country Life Commission.

There is presented an analysis of the agencies already at work, the relations of the agricultural to the general educational system, and the relations of the agricultural college to present social problems. The author held that inasmuch as civilization develops out of industries and occupations, and the agricultural colleges represent this civilization, they can not be properly considered as class institutions. The three-fold function of such colleges, the "discovery of fact, teaching it to students, taking it to all the people," was clearly emphasized and elaborated. The suitable training of agricultural teachers was characterized as the "greatest work now before this college." The present support of college education in agriculture in the State of New York was shown to be at the rate of only one sixty-sixth of 1 per cent of the property valuation of the State.

Agriculture in secondary schools, T. F. Hunt (*Ann. Rpt. Penn. Dept. Agr., 13 (1907), pp. 382–395*).—A review is given of progress in introducing agriculture into secondary schools, and attention is called to available literature and other facilities to aid in carrying on such work.

Rural education, A. C. True (*Ann. Rpt. Penn. Dept. Agr., 13 (1907), pp. 231–237*).—Attention is called to the desirability of introducing instruction in agriculture into the rural school curriculum, and examples of successful work along this line are cited.

The education of the farmer, C. De Mar (*Ann. Rpt. Ohio Bd. Agr., 62 (1907), pp. 572–575*).—This paper, read at the farmers' institute held at Newtown, Ohio, December 6, 1907, discusses the value of farmers' institutes, the importance of home industrial training, recreation, and good, business-like farm management.

Domestic science, Alice Penrose (*Ann. Rpt. Ohio Bd. Agr., 62 (1907), pp. 478–481*).—This paper, read at the farmers' institute held at Damascus, Ohio, February 26 and 27, 1908, points out in detail the value for girls of this kind of work in furnishing immediate application in the home for the facts learned in school in the lines of cooking, chemistry, bacteriology, and physiology. These applications are of great service in interesting the mothers as well in the advancement of modern domestic practice.

The nature-study outlook, L. H. Bailey (*Nature-Study Rev., 4 (1908), No. 6, pp. 169–172*).—This informal address considers several important considerations in nature-study work. The author maintains that the ordinary public school seems to lack motive power, being dominated too much by system, regularity, and college ideals, and that "the formal literary college entrance requirement is not an expression of the best activities of living." He believes that while nature-study work should be systematic, definite, and have relation, nevertheless it is easy to make it so formidable as to take the life out of it. "Laboratory teaching may be just as far from life as book teaching is; it all depends on the intention and the mode."

Wanted: A philosophy of nature study. C. H. Robison (*Nature-Study Rev., 4 (1908), No. 7, pp. 206, 207*).—This important theme is treated suggestively rather than elaborately. Emphasis is laid upon the belief that the method of approach must depend on the philosophic basis of our theory "on whether we regard the child as a member of a present and a future society or as an isolated individual, as a social creature, or solely as an intellectual being." The author considers aims and theory as being still in a chaotic state, needing a master's treatment; so that while the "what" is rather definitely understood, the "why" leaves much to be desired, and the "how" must be largely conditional on a clearly worked out rationale. He concludes that much of our present procedure rests on faith rather than on definitely determined psychological results.

The training of teachers of nature study. J. W. Shepherd et al. (*Nature-Study Rev., 4 (1908), No. 6, pp. 173–182, 193–196*).—The first of these papers points out that a large part of elementary science work has been diluted college work, that much of the laboratory work does not raise a personal problem for the individual student, and that the nature-study teacher must come over to the children's standpoint and concern herself with furnishing them rich, vital experiences, rather than developing scientific generalities. To this end the student-teacher should herself have experiences as a student with the same kind of material that the children will use in nature study.

O. P. Dellinger, in discussing the same general subject, holds that the nature-study training course should differentiate nature study from what it is not, make clear the aim of nature study as distinct from that of other related subjects, acquaint the student-teacher with the literature of the subject, give a few type outlines of lessons, and stratify the work for the different grades.

M. A. Bigelow sets forth the belief that nature study should not be limited to any particular phase of the subject, that direct observational study is the essential method, that the study should be made from the standpoint of nature as it touches our daily lives, and that close imitation of the technical science of higher schools is highly undesirable for nature study in the elementary schools.

C. F. Hodge contributes a paper the essence of which appears in the following quotation: "It would be far better if biology teachers in our normal schools be drawn from graduates of our agricultural colleges, or from the ranks of intelligent gardeners and horticulturists, than from those who have had the present biology course in many colleges and have been given no hint that it is not and can not be 'adapted' to the needs of normal-school students and grade pupils. If the colleges are to train normal-school teachers in biology, it is imperative that they supplement their present technical courses by a thorough course in biological nature study."

Nature courses and science courses. W. F. Ganong (*Nature-Study Rev., 4 (1908), No. 8, pp. 242–246*).—This is a reply to a criticism offered by C. F. Hodge on the ordinary courses in secondary science work, as noted above. The author defends them on the ground that they are practicable of educational administration, that the information they impart is worth far more to the majority of students than that offered as substitutes under the name of nature study, and that they give an intellectual training far superior.

Recent aspects of the nature-study movement. E. Davenport (*Nature-Study Rev., 4 (1908), No. 9, pp. 261–264*).—The author points out the advantage of agriculture as nature study in the fact that it utilizes the child's personal desire to produce something, and thus awakens the three strongest impulses to activity—his observing powers, the possibility of exerting controlling influence over natural processes, and the actual production of objects that had no

previous existence as such. He believes that the appeal of agriculture lies in its utility to the race, and that certain phases of agriculture, well taught in a good high school, are a valuable means of education for any man, as well as for the one who is to be a farmer. He suggests, for example, that there is no plant known to botany more significant in its histological and physiological aspects than is Indian corn, which has the added advantage of a deep significance to our social and economic welfare; for "we learn more from inference, even in school, than we do by the direct method."

A school-room study of a robin's nest. JESSIE R. MANN (*Nature-Study Rev., 4 (1908), No. 9, pp. 265–271, fig. 1*).—This study was undertaken as a definite attempt to answer questions raised by the children concerning the number of times a day young birds are fed, whether the father helps in the feeding, what kind of food the parents bring, and how long before the young will fly. Each pupil prepared ruled sheets of paper for the following items: (1) The number of the feeding for that day, (2) time of feeding, (3) the parent bringing the food, (4) the kind of food brought, (5) the nestling fed (numbered 1, 2, or 3 with ink on its bill), and (6) remarks. Complete all-day observations were made for 6 days—for 3 days in succession in the beginning and for the last 3 days before the birds left the nest when 13 days old. Progressive drawings were made of the dorsal view of the young birds, the leg and wing structure compared with the human limbs, the development of feather growth and structure, and sketches of the alimentary canal with a study of its functions.

MISCELLANEOUS.

Twenty-first Annual Report of Arkansas Station, 1908 (*Arkansas Sta. Rpt. 1908, pp. 16*).—This includes the organization list of the station and a report of the acting director, the latter containing an account of the work and publications of the station and a financial statement for the fiscal year ended June 30, 1908.

Twenty-first Annual Report of Indiana Station, 1908 (*Indiana Sta. Rpt. 1908, pp. 97*).—This contains the organization list, reports of the director and heads of departments, the experimental work of which is for the most part noted elsewhere in this issue, a list of the periodicals received by the station, a list of the bulletins and circulars issued by the station to January 1, 1909, and a financial statement as to the Federal and miscellaneous funds for the fiscal year ended June 30, 1908, and as to the State funds for the fiscal year ended September 30, 1908.

Twenty-first Annual Report of Louisiana Stations, 1908 (*Louisiana Stas. Rpt. 1908, pp. 46*).—This contains the organization list, a report of the director and departmental reports on the work of each of the stations and of the State geological survey, lists of available publications and of those issued during the year, a summary of the analytical work on fertilizers, feed stuffs, Paris green, and miscellaneous material, and a financial statement as to the Federal funds for the fiscal year ended June 30, 1908, and as to the State funds for the fiscal year ended November 30, 1908.

A visitor's guide to the more important features of the station's work. F. H. BALLOU (*Ohio Sta. Circ. 85, pp. 5½, figs. 60*).—A revision of a circular previously noted (E. S. R., 18, p. 691).

Accessions to the Department Library, October–December, 1908 (*U. S. Dept. Agr., Library Bul. 70, pp. 61*).

NOTES.

Arkansas University and Station.—The appropriations received from the legislature for the ensuing biennium aggregate $64,900, an increase of $29,700. An appropriation of $8,000 has also been made for farmers' institute work, which has been organized as a department of the college, with G. A. Cole, the former agriculturist, as superintendent.

Dr. R. R. Dinwiddie has retired from active station work, but will continue as consulting pathologist and bacteriologist.

Colorado College.—C. A. Lory, for several years professor of physics and electrical engineering, has been elected president.

Connecticut State Station.—At the request of the Massachusetts authorities, Dr. G. P. Clinton, botanist of the station, has gone to Japan to secure and bring to this country, if possible, a fungus which is parasitic on the gipsy moth.

Clarence Rodman resigned as chemist on May 8, and has been succeeded by R. B. Roe.

Hawaii Federal Station.—The territorial legislature at its recent session made an appropriation to the station of $5,000 annually for the next biennial period, to enable the carrying on of more extensive experiments in forage production, crop rotation, soil studies, and plant diseases. In addition to this sum, about $5,000 annually from funds derived from a territorial income tax is to be at the disposal of the station.

The desirability of improving transportation facilities and marketing methods of Hawaiian agricultural products has become generally recognized in the Territory, and with a view to securing a basis for practical legislation the appointment by the governor of a commission to investigate the matter was authorized. The special agent in charge of the station has been made chairman of this commission, and work has already been begun. Cooperation has been effected with the promotion committee, the chamber of commerce, various associations of growers, and the farmers' institute, and it is expected that financial assistance can be obtained from the legislature upon the formulation of a suitable working plan.

Illinois University and Station.—According to *Illinois Agriculturist*, C. E. Lee, assistant professor of dairy manufactures in the university and assistant chief in dairy manufactures in the station, has accepted the assistant professorship of dairy husbandry at the University of Wisconsin.

Iowa College and Station.—*Science* notes the resignation of E. T. Robbins, assistant animal husbandman, to accept a position on the editorial staff of *The Breeders' Gazette*.

Louisiana Stations.—A substation for rice culture has been established at Crowley, and work began there this spring. Local parties gave 60 acres of land for the use of the station and subscribed $3,500 for buildings. The last legislature authorized the establishment of a rice station, but made no appropriation. It will be maintained for the present out of the fertilizer funds. The Bureau of Plant Industry of this Department will cooperate in the work by stationing a rice specialist there and sending experts from time to time.

Maine University.—Because of the great demand for teachers competent to teach agriculture in secondary schools, the college of agriculture will offer a one-year course in agriculture for teachers, to begin September 15. The course is open to college graduates, to high-school teachers with at least two years' experience, and to normal-school graduates who have had three years' experience in teaching.

Michigan College and Station.—At a recent meeting of the governing board Dr. W. J. Beal was appointed station botanist, this including membership in the station council. Dr. J. B. Dandeno was appointed assistant botanist and a member of the advisory staff.

In connection with the extension work of the college and station an experimental union has been organized. In the spring of 1908, 32 farmers undertook cooperative experiments in alfalfa growing, and during March and April of the present year 93 farmers, 67 of whom had attended the short courses, undertook cooperative work with grains. About 62 bushels of improved seed have been furnished by the college and distributed in 46 counties. Under the arrangement agreed upon, the cooperator pays the freight or express charges and reports results to the college.

Minnesota University and Station.—According to the *Minneapolis Morning Tribune* of May 8, the board of regents has established in the college of agriculture a two-year course in industrial and agricultural education for the preparation of teachers in the agricultural high schools provided for by the recent legislature. A summer school for teachers is being held for three weeks, beginning June 21.

A short course in traction engineering has been offered for the four weeks beginning May 25. The course of study included steam boilers, traction and stationary steam engines, gasoline, kerosene, and denatured alcohol engines, and their operation, repair, etc.

Minnesota Farm Review notes the appropriation by the legislature of $2,000 for tobacco experiments.

Missouri University.—The enrollment in the university courses in animal husbandry is now 456, an increase of 86 per cent in the last three years. A considerable portion of the increase is in the elective courses. In addition, the short course enrollment in animal husbandry courses for the year was 160, as compared with 50 in 1907.

Nebraska University and Station.—Dr. S. Avery, acting chancellor since December, 1908, has been appointed chancellor of the university. Dr. C. E. Bessey, who was dean of the industrial college, which has recently been divided into separate colleges of agriculture and engineering, has been appointed head dean in the university, thereby becoming chairman of the board of deans and acting chancellor in the absence or indisposition of the chancellor. E. A. Burnett and C. R. Richards, formerly associate deans in the industrial college, have been made deans of the colleges of agriculture and engineering, respectively.

The new college of agriculture is to include the university work in general and technical agriculture, forestry, and domestic science. The departments of soils and farming crops have been reorganized into a department of instructional agronomy and farm management and a department of experimental agronomy. These are to be in charge, respectively, of C. W. Pugsley and E. G. Montgomery. The former will also act as soil agronomist in the station. T. A. Kiesselbach has been transferred from instruction work to become assistant in experimental agronomy. P. B. Barker has been appointed adjunct professor of agronomy and assistant in agronomy (soils) in the station.

Other recent appointments include R. E. Stone as assistant professor of agricultural botany and assistant in the station; R. C. Ashby and Ellis Rail as adjunct professors of animal husbandry; R. S. Trumbull as adjunct professor of agricultural chemistry; R. F. Howard as adjunct professor of horticulture, and Erwin Hopt as assistant in field crops at the North Platte substation, and instructor of agronomy in the school of agriculture. Alvin Keyser resigned as professor of soils June 1 to accept the professorship of agronomy in the Colorado College and Station.

Science notes that the regents are taking steps to locate the two additional substations provided for by the legislature; one is contemplated for the sand hill regions of central Nebraska and the other in the irrigated section in the western part of the State.

New Jersey College and Stations.—Daniel W. Horner, John E. Darnell, Samuel B. Ketcham, Abram C. Holdrum, and Henry Bell, of the board of managers of the State Station, and J. B. Drury, of the board of trustees of the college, have resigned and have been succeeded by Alexander P. Owen, of Mickleton, A. Engle Haines, of Medford, Frank E. Bate, of Fishing Creek, Philip Todd, of Peapack, Albert Richards, of Dover, Charles C. Basley, of Maywood, and Edwin Radford, James McCarthy, and Emil Bonnot, of Jersey City.

Dr. B. H. A. Groth, a graduate of Harvard University, was appointed plant physiologist of the college station April 1, for research under the Adams Act. Leon A. Congdon, a graduate of Syracuse University, has been appointed assistant chemist at the State Station in connection with the fertilizer and feedstuffs inspection.

Cornell University.—The legislature has appropriated $175,000 for the maintenance of the college of agriculture, an increase over last year of $25,000.

New York State Station.—In connection with the proposed grape investigations in Chautauqua County, the station has leased a 30-acre farm near Fredonia, where work will be carried on in general vineyard management and the investigation of grape diseases and insects. In the grape disease work the Cornell Station is to cooperate. F. E. Gladwin, previously a nursery inspector under the State department of agriculture, is to be in general charge of the work in Fredonia, and Frederick Z. Hartzell, of Cornell University, has been appointed to carry on the entomological investigations.

W. J. Young, formerly scientific assistant in the Bureau of Chemistry of this Department, has accepted a position as student assistant in horticulture at the station.

North Dakota Station.—A pure-seed law has been enacted by the legislature, under which a seed-inspection laboratory is to be established at the station.

Oregon College.—The college is offering a reading course of five lessons in poultry husbandry. A set of questions accompanies each lesson, and at the end of the course a written examination will be given. Satisfactory completion of the course will count a certain number of points in a poultry contest to begin in the fall, though the taking of the course will not be required of those entering the contest.

Pennsylvania College and Station.—The appropriations by the legislature for the ensuing biennium for the college and station aggregate $525,999.76. Among the items of expenditure authorized are $170,786 for the school of agriculture and the station, $169,050 for the school of engineering, $9,368 for the maintenance of the department of home economics, and $4,000 for the institute of animal nutrition.

Porto Rico Station.—Martin J. Iorns, horticulturist since December, 1906, died in the hospital at San Juan, May 17. Doctor Iorns was born in Louisiana in

1867, and was graduated from Cornell College, Iowa, in 1892. Upon graduation he engaged in civil engineering work and later in teaching, serving as principal of several schools in Iowa and Illinois and as instructor in Cornell College. He took up graduate work at the University of Chicago in 1898, specializing for three years in chemistry, botany, physics, and geology, and serving as laboratory assistant.

In 1900 he was appointed to the chair of science of Fort Worth University, Texas, and also served as lecturer in the medical college. This position he resigned in 1904 to enter the college of agriculture of Cornell University as a candidate for the degree of Ph. D., choosing horticulture as a major subject and physiography and soils as minors. Upon receiving the degree in 1906 he served as assistant on the hydrographic survey of Iowa for the United States Geological Survey until receiving his Porto Rico appointment.

The work of Doctor Iorns in Porto Rico had been attended with much success and his death is a distinct loss to the horticultural interests of the island. He had under way a number of promising investigations which were being pursued with great energy and ability. He was joint author with the former horticulturist of a bulletin recently issued by the station on Pineapple Growing in Porto Rico, a contributor to the newly established *Porto Rico Horticultural News*, and the author of numerous shorter articles. His short career at the station was characterized by an unselfish devotion to duty and a warm-hearted sympathy with the people for whom he was laboring, which won for him the highest commendation.

Rhode Island College.—By a recent act of the general assembly the name of the college has been changed from Rhode Island College of Agriculture and Mechanic Arts to Rhode Island State College. The work on the new dormitory and assembly hall is progressing rapidly, and it is hoped to have the building ready for occupancy in the autumn.

Tennessee Station.—L. R. Neel has been appointed assistant in cooperative experiments at Columbia.

Texas College and Station.—The legislature has passed a bill establishing four new substations, one to be located in the western part of the State, one in the northwestern portion, one in the black-land belt of the north or central portion, and one in the southern or southeastern portion, together with such other substations as the governing board may determine. The sum of $25,000 annually for the biennium beginning September 1 has been appropriated for the establishment and maintenance of these substations.

Work has been begun on the new $35,000 station administration building, and it is expected that this will be completed by September 1. For equipment about $15,000 will be available from the surplus derived from fees collected under the State feeding stuffs inspection law.

The new engineering building, costing $65,000, is to be completed about August 1. The departments of civil, electrical, and architectural engineering are to be quartered in this building.

L. L. McInnis, of the board of directors, has been succeeded by A. R. McCollum, of Waco.

Vermont University and Station.—M. B. Cummings, a graduate of the university in 1901 and at present assistant in horticulture at Cornell University, has been appointed professor of horticulture in the university and horticulturist in the station, vice William Stuart, whose resignation has been previously noted. H. L. Miner, assistant chemist, has resigned to engage in commercial work.

Washington College.—A better-farming special train, sent out March 22–27 through five counties in the eastern part of the State, was visited by nearly

10,000 persons on its trip. W. D. Foster has been promoted to the superintendency of the college farm.

Wisconsin University.—The *Student Farmer* announces that the board of regents has recently established two fellowships at $400 a year and two scholarships at $225 a year for graduate students in agriculture. These are to be open to graduates of colleges of recognized standing and other students with equivalent education, and both men and women are to be eligible.

United States Department of Agriculture.—C. B. Lane, assistant chief of the Dairy Division since 1903, has resigned to accept a position with a large dairy concern in Philadelphia, taking up his new work about June 15.

James B. Rorer, of the fruit disease investigations of the Bureau of Plant Industry, has accepted a two-year appointment as mycologist and pathologist for the Board of Agriculture in Trinidad, and has entered upon his duties.

Dr. C. C. Clark, associate statistician of the Bureau of Statistics, has resigned to become statistician of the International Institute of Agriculture at Rome.

Fourth Graduate School of Agriculture.—The fourth session of the Graduate School of Agriculture is to be held during the summer of 1910 at Ames, Iowa, under the auspices of the State College of Agriculture and Mechanic Arts. The school will, as formerly, be under the general management of the Association of American Agricultural Colleges and Experiment Stations through its committee on graduate study, of which Dr. H. P. Armsby has recently been made chairman. Dr. A. C. True, of this Office, has again consented to serve as dean.

Cuban Experiment Station.—J. T. Crawley resigned as director May 15. The personnel of the station now includes José G. Couret as vice-director and the following chiefs of departments: Agriculture, J. C. Pagliery; animal industry, Emilio L. Luaces; chemistry, Diego V. Tejeda; vegetable pathology, W. T. Horne; and botany, vacant; and twenty-nine assistants. No provision has been made for continuing the horticultural department. It is reported unofficially that Ramón Garcia Osés has been made director of the station.

Agricultural and Educational Meetings.—The twenty-sixth annual convention of the Association of Official Agricultural Chemists is to be held at Denver, Colo., August 26–28, and the meeting of the Association of State and National Food and Dairy Departments is to be at the same place from August 24 to 27. The Society for the Promotion of Agricultural Science is to meet at Portland, Oreg., August 17. The fourth Dry Farming Congress is to meet at Billings, Mont., October 26–28. It is announced that 17 States and 10 foreign countries will be represented by delegates.

The forty-seventh annual convention of the National Education Association is to be held at Denver July 3–9. The programme for the department of rural and agricultural education includes a round table conference on How May the Rural Schools be More Closely Related to the Life and Needs of the People, led by D. J. Crosby, of this Office, and addresses by S. A. Knapp on Agricultural Education for the Rural Districts, E. E. Balcomb on The Type of Farmers' and Teachers' Institutes Used in Oklahoma to Help in Introducing Agriculture and Industrial Work into the Common Schools, H. H. Seerley on National Aid in the Preparation of Teachers of Agriculture for the Public Scools, E. C. Bishop on The Present Status of Agricultural Education in the Public Schools, Josiah Main on Agriculture Correlated with Science Work for High Schools, and Riley O. Johnson on Agriculture for the Elementary Schools. Considerable attention to agricultural education and its interests will also be given in other departments, notably those on normal schools and manual training.

Among the societies to meet with the association are the National Committee on Agricultural Education and the American Home Economics Association.

Secondary Agricultural Schools in Arkansas.—An appropriation of $160,000 has been made by the Arkansas legislature for four secondary agricultural schools. The State is to be divided into four districts and the location of the schools will be determined by their respective governing boards.

Pennsylvania Appropriations for Agricultural Education.—In addition to the very large appropriations for the Pennsylvania College and Station, noted elsewhere in this issue, the legislature appropriated $40,000 for the State Forest Academy at Mount Alto and $25,000 for the National Farm School at Doylestown.

Proposed Agricultural College in Saskatchewan.—It is announced that the recently established University of Saskatchewan is to be organized along lines similar to the state universities of this country, and that it will include a college of agriculture. A site has been selected at Saskatoon, about 250 miles north of the Canadian border of Montana, where a tract of nearly 1,200 acres has been set aside for the college farm and campus. The college is to include departments of animal husbandry and veterinary science, field husbandry and soils, farm mechanics, including carpentry, blacksmithing and farm machinery, dairying, horticulture and tree planting, nature study, including biology and geology, chemistry, physics, mathematics, and English. There will also be an extension department, which will take over the work now carried on by the agricultural societies, under the direction of the superintendent of fairs and institutes.

W. J. Rutherford, deputy commissioner of agriculture of the Province of Saskatchewan, has been appointed dean of the college of agriculture, and John Bracken, superintendent of fairs and institutes, as one of the professors. The organization of the college is to proceed at once under their supervision. Buildings of modern type are to be erected ready for occupancy in the fall of 1910, when it is planned to open the institution to students.

School Gardens for the South.—H. P. Stuckey, of the Georgia Station, began in the March number of the *Southern Ruralist*, a series of articles on School Gardens for the South. Among the topics so far considered are the educational value of the school garden, seed supplies, the kinds of work especially adapted to the different seasons, and suitable laboratory exercises.

Miscellaneous.—The recent death is noted of William H. Council, Ph. D., president of the Agricultural and Mechanical College for Negroes at Normal, Ala., following a long period of ill health.

Dr. Francis Watts, of Antigua, Leeward Islands, has accepted the position of Imperial Commissioner of Agriculture for the West Indies, vice Sir Daniel Morris, whose resignation has been previously noted.

The *Canterbury A. and P. Associations Journal* for April announces the appointment of Robert Alexander as director of the Canterbury Agricultural College, Lincoln, near Christchurch, New Zealand.

A gift of $100,000 has been made to Yale University by Mrs. Morris K. Jessup to establish the Morris K. Jessup chair of agriculture in the forestry school.

The Order of the Red Eagle, third class, has been conferred upon Prof. O. Kellner, director of the Moeckern Experiment Station.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*
Assistant Editor: H. L. KNIGHT.

EDITORIAL DEPARTMENTS.

CONTENTS OF VOL. XX, NO. 12.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY.

METEOROLOGY—WATER.

SOILS—FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

FOODS—HUMAN NUTRITION.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING—AGROTECHNY.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

EXPERIMENT STATION RECORD.

VOL. XX. JUNE, 1909. No. 12.

With the present number the abstract portion of the twentieth volume of *Experiment Station Record* is brought to a close. This portion of the volume contains 1,200 pages, of which 1,054 are devoted to abstracts, 76 to editorials and special articles, and the remainder to station and miscellaneous notes. The customary author and subject indexes will be issued separately somewhat later.

The number of abstracts in the volume is 5,336, which is by far larger than in any previous volume, and nearly 700 in excess of the number in Volume XIX. It is estimated that the preparation of this material involved the review of 40 reports of the American experiment stations, 398 station bulletins and circulars, and 232 publications of this Department, together with the examination of fully 20,000 copies of other publications, including periodicals, books, etc., appearing in twelve or more different languages.

The distribution of the abstracts by subjects was as follows: Agricultural chemistry, 469; meteorology—water, 193; soils—fertilizers, 666; agricultural botany, 176; field crops, 306; horticulture, 223; forestry, 222; plant diseases, 259; economic zoology—entomology, 542; foods—human nutrition, 559; animal production, 383; dairy farming—dairying—agrotechny, 304; veterinary medicine, 475; rural engineering, 97; rural economics, 197; agricultural education, 169; and miscellaneous, 96.

The twenty volumes of the Record thus far issued contain about 71,650 titles, besides editorials, special articles, and notes. The station reports abstracted have numbered 868, the station bulletins and circulars 6,912, and the publications of this Department 3,055.

It is of interest to note that of the total number of abstracts about 36,400, or somewhat more than one-half, have appeared in the eight volumes issued since the publication of the first general index. It is hoped to cover this period by a general index to Volumes XIII–XX in the near future.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY.

Principles and practice of agricultural analysis, H. W. Wiley (*Easton, Pa., 1908, vol. 2, 2. ed. rev. and enl., pp. XI+680, pls. 7, figs. 40*).—This is a second revised and enlarged edition of this volume, which deals with fertilizers and insecticides. The preface states that "a great part of the material relating to the occurrence and analysis of ammonia, nitrous and nitric acid printed in the first volume of the first edition of this work has been rewritten and transferred to this volume. . . . All the matter of this volume has been rewritten and brought down to date. New features of moment are those relating to the production of nitric acid for manurial purposes from cyanamid and by direct electric oxidation of the nitrogen of the air. A chapter on the analysis of insecticides has also been added."

Volume 1 of the work has been previously noted (E. S. R., 18, p. 607).

Report of progress in agricultural chemistry in 1907, T. Dietrich et al. (*Jahresber. Agr. Chem., 3. ser., 10 (1907), pp. XXXV+623*).—This volume reviews as usual, by abstract of the more important articles and by title of those of less importance, the published accounts of the work of 1907 in the whole field of agricultural chemistry.

The more important articles on sugar chemistry which have appeared in 1908, E. O. von Lippmann (*Deut. Zuckerindus., 33 (1908), Nos. 28, pp. 600–603; 29, pp. 616–617; 30, pp. 636–638; 34 (1909), Nos. 5, pp. 105–107; 6, pp. 124, 125; 7, pp. 142–144; 8, pp. 161, 162*).—A digest of recent investigations.

The solubility of lime in water, G. T. Moody and L. T. Leyson (*Jour. Chem. Soc. [London], 93 (1908), No. 553, pp. 1767–1772, figs. 2; abs. in Analyst, 34 (1909), No. 395, p. 72; Ztschr. Angew. Chem., 22 (1909), No. 9, p. 397, fig. 1*).—A study of various conditions affecting the solubility of lime in water, which grew out of the observation that the limewater used in volumetric analysis varied very greatly in composition, is reported in this article, and determinations of the exact solubility of lime at temperatures of from 2° to 80° are given.

The decomposition of feldspar by water, W. Funk (*Ztschr. Angew. Chem., 22 (1909), No. 4, pp. 145, 146; abs. in Jour. Soc. Chem. Indus., 28 (1909), No. 4, p. 202; Jour. Chem. Soc. [London], 96 (1909), No. 556, II, p. 146; Bul. Soc. Chim. France, 4. ser., 6 (1909), No. 7, p. 491*).—Tests showing the ease with which a certain portion of the alkali of even the coarser particles of ground feldspar is extracted by water alone are briefly described.

The different forms of nitrogen in proteins, T. B. Osborne, C. S. Leavenworth and C. A. Brautlecht (*Amer. Jour. Physiol., 23 (1908), No. 3, pp. 180–200*).—As the authors point out, with available means it is not yet possible to determine accurately most of the monoamino-acids obtained in the cleavage of proteids, the results obtained by the methods falling considerably below the actual amount of these amino-acids which are produced by hydrolysis.

The results of an extended study of the determination of basic products of proteid decomposition are reported "which have led us to believe that under

suitable conditions a very considerable degree of accuracy can be obtained in determining ammonia, histidin, arginin, and lysin. We also believe that these determinations afford the best means now available for differentiating the many forms of proteins. . . . The data obtained respecting the determination of ammonia make it highly probable that the results are very accurate, and that this ammonia originates from an amid union in the protein molecule."

Determinations of the actual quantities of histidin, arginin, and lysin present in a number of proteids have shown that the amount of nitrogen contained in these bases corresponds closely with that precipitated by phosphotungstic acid.

"In view of the close agreement between the amount of nitrogen precipitated by phosphotungstic acid and the sum of the nitrogen contained in the arginin, histidin, and lysin which the large number of different proteins from many sources yield on hydrolysis, it seems improbable that other basic products than those just named will be found in the future among the decomposition products of the proteins. In respect to accuracy, the determinations of histidin, arginin, and lysin appear to leave little to be desired if the methods of analysis are carefully and properly carried out.

"It was found that for many proteins a much longer hydrolysis was necessary to liberate all of the bases than has been heretofore supposed. Apparently a considerable part of these bases is present in some of the proteins in very difficultly hydrolyzable combinations which require 24 hours, or more, continued boiling with 25 per cent sulphuric acid for their complete dissolution. This condition was found to hold especially for the proteins of leguminous seeds.

"The wide differences between seed proteins in the proportion of nitrogen precipitated by phosphotungstic acid is chiefly caused by differences in the amount of arginin which was obtained from all of them. This forms about 1 per cent of the protein containing the least, and over 14 per cent of those containing the most, basic nitrogen. The amount of histidin which was also obtained from all of the proteins was nearly the same in the majority of the proteins analyzed, that is, about 2.5 per cent. The amounts of lysin found in the several proteins differed considerably, none being present in any of the alcohol soluble proteins, 4 to 5 per cent in most of the leguminous seed proteins, and over 6 per cent in conalbumen from hen's egg.

"The proteins, when arranged in the order of their yield of arginin, fall into three groups: first the oil seeds, then the leguminous seeds, and finally the cereal grains—the only exception being the glutelin of maize, which is one of the least well characterized and studied of all the proteins in the list, and may be a mixture of several different proteins. . . .

"We have in the chemical constitution of these seed proteins an apparent relationship not only to the biological relations of the plants which produced them, but also to the chemical constitution of the seeds themselves."

Products formed by the decomposition of casein, I. W. Bissegger and L. Stegmann (*Ztschr. Physiol. Chem., 58 (1908), No. 2, pp. 147–152; abs. in Jour. Chem. Soc. [London], 96 (1909), No. 555, I, p. 72*).—Details are given for the isolation of a new basic substance obtained from the lysin fraction. When casein is digested with pancreatin and pepsin in the presence of toluene and sodium fluorid, tetra- and penta-methylenediamins can not be isolated.

On the presence of isoleucin in casein, R. Weitzenböck (*Monatsh. Chem., 27 (1906), pp. 831–837; abs. in Milchw. Zentbl., 5 (1909), No. 1, p. 38*).—Among the cleavage products in the hydrolysis of casein, the author found leucin, isoleucin, and phenylalanin in the first fraction when precipitated with phosphotungstic acid. These substances were not obtained in the pure state but were always united with aminovaleric acid.

A note on the constitution of phytin, E. Winterstein (*Ztschr. Physiol. Chem., 58 (1908), No. 2, pp. 118–121*).—Data on the characteristics of phytin are summarized and the question of its constitution is discussed.

The inversion of cane sugar by invertase, II, C. S. Hudson (*Jour. Amer. Chem. Soc., 30 (1908), No. 10, pp. 1564–1583, figs. 3*).—The author points out that the neglect of the mutarotation of the invert sugar in studying the inversion of cane sugar by invertase has led to a series of erroneous conclusions on the laws of the action of this enzym. The investigations which he reports are a critical contribution to the subject in continuation of work previously noted (E. S. R., 20, p. 611).

Gravimetric determination of nitric acid, A. Hes (*Ztschr. Analyt. Chem., 48 (1909), No. 2, pp. 81–98; abs. in Analyst, 34 (1909), No. 396, pp. 114, 115; Ztschr. Angew. Chem., 22 (1909), No. 15, pp. 684, 685; Jour. Chem. Soc. [London], 96 (1909), No. 557, II, p. 265; Chem. Zentbl., 1909, I, No. 7, p. 579*).—A study of the influence of concentration of solution and the presence of various other substances on the accuracy of the determination of nitric acid by means of nitron according to the Busch method (E. S. R., 16, p. 945) is reported.

It was found that this method gives entirely reliable results when used with a 0.1 per cent nitrate solution. With very dilute solutions the nitric acid is not precipitated or only partly precipitated by nitron. Dextrin, gelatin, and perhaps other organic compounds interfere with the crystallization of nitron nitrate. The presence of aluminum sulphate, magnesium sulphate, ammonium sulphate, potassium phosphate, magnesium chlorid, tartaric acid, citric acid, saccharose, and glucose do not interfere with the accurate determination of nitric acid. Higher results are obtained in the presence of oxalic acid. The difference, however, does not correspond to the amount of oxalic acid present, but is very irregular.

Chloric acid is quantitatively precipitated by nitron in the form of nitron chlorate in solutions containing about 0.25 per cent of chloric acid. In solutions which contain both chloric and nitric acids the nitron precipitates both of these acids quantitatively.

Modification of the Kjeldahl method, R. Corradi (*Indus. Quim., 1908, p. 189; abs. in Ann. Chim. Analyt., 14 (1909), No. 1, pp. 29, 30*).—A method specially adapted to the analysis of food materials is described. The nitrogen is determined in the Kjeldahl distillate by decomposition with sodium hypobromite and the measurement of the free nitrogen in a Dupré azotometer.

The determination of potash as potassium molybdic phosphate, A. Schlicht (*Chem. Ztg., 32 (1908), Nos. 93, pp. 1125, 1126; 94, pp. 1138–1140; abs. in Analyst, 34 (1909), No. 394, p. 39; Jour. Chem. Soc. [London], 96 (1909), No. 555, II, p. 94*).—The method proposed is in brief as follows: Mix 0.1 gm. of potassium sulphate free from ammonium salts with 10 cc. of the author's molybdic reagent and evaporate to dryness. Take up with 10 cc. of hot 5 per cent solution of magnesium sulphate, and when cold collect the precipitate on an asbestos filter, wash first with 10 cc. and then with 5 cc. of 5 per cent magnesium sulphate, and then again three times with 5 cc. of 5 per cent ammonium nitrate, finally with alcohol and ether. Dry or ignite and weigh.

The molybdic reagent is prepared as follows: Dissolve 100 gm. of molybdic acid in water, add 250 gm. of crystallized sodium carbonate, evaporate to dryness, and heat the residue for 2 hours at 150°. Dissolve 500 cc. in water. Dissolve 6 gm. of magnesium pyrophosphate in boiling nitrohydrochloric acid and evaporate repeatedly with nitric acid to expel the chlorin. Dissolve the residue in a little water and nitric acid (specific gravity 1.36) and dilute to 500 cc. with acid of the same strength. To this add gradually and with stirring

the molybdic solution and another 500 cc. of water, and filter after standing for 2 hours.

On the quantitative determination of potash, H. Kühl (*Pharm. Zentralhalle, 50 (1909), No. 7, pp. 127–129*).—Methods for the determination of potash in potash salts, sludge, and other organic substances are briefly described.

Determination of insoluble phosphoric acid, F. B. Carpenter (*Jour. Indus. and Engin. Chem., 1 (1909), No. 2, p. 119*).—Attention is called in this article to the difficulty of securing an ammonium citrate of uniform composition by the official methods.

The determination of phosphoric acid in Thomas slag by weighing the yellow ammonium phosphomolybdate precipitate, Z. Románski (*Chem. Ztg., 33 (1909), No. 6, pp. 46, 47, fig. 1; Ztschr. Angew. Chem., 22 (1909), No. 9, p. 400; abs. in Jour. Chem. Soc. [London], 96 (1909), No. 556, II, p. 182; Chem. Zentbl., 1909, I, No. 7, p. 580*).—The author reports tests of a modification of the Lorenz method in which the ordinary Wagner molybdic solution is used for precipitation in presence of a mixture of nitric and sulphuric acids (34 cc. of sulphuric acid of 1.84 sp. gr. in 1 liter of nitric acid of sp. gr. 1.2) and the precipitate is finally washed with benzin (sp. gr. 0.64 to 0.7) instead of ether. The results obtained by this method in a large number of determinations were found to agree quite closely with those obtained by the Wagner molybdic method.

Determination of caustic lime, P. Philossophoff (*Chem. Ztg., 33 (1909), No. 8, pp. 67, 68*).—It is maintained that Pöpel's ammonium chlorid method (E. S. R., 20, p. 703) is inaccurate on account of the fact that calcium carbonate will drive off ammonia from ammonium chlorid in warm solution.

Progress report of the committee on standard methods of chemical analysis of water and sewage, E. B. Phelps et al. (*Amer. Jour. Pub. Hyg., 18 (1908), No. 4, pp. 419–424*).—This is a summary of information secured from replies to a circular of inquiry. It refers to changes suggested in methods of determining turbidity, free ammonia, organic nitrogen, nitrates, copper, hardness, manganese, hydrogen sulphid, free chlorin, alum, sewage sludge, putrescibility in sewage work, filter control, and field assay of water.

The examination of waters in place, H. Klut (*Untersuchung des Wassers an Ort und Stelle. Berlin, 1908, pp. VII+159, figs. 29*).—This is a revision and enlargement of an article first published in *Pharmazeutischen Kalender, 1908*. It gives plain directions for the taking of samples and for quickly testing temperature, turbidity, color, organic matter, smell, taste, nitrous and nitric acids, ammonia compounds, hardness, reaction, bacteriological character, iron, free carbon dioxid, dissolved oxygen, lead, and manganese.

Detection and determination of nitrates and nitrites in water, Tabuteau (*Arch. Méd. Angers, 1908, Sept. 20; abs. in Ann. Chim. Analyt., 14 (1909), No. 1, pp. 17–19*).—Various methods which are available for detecting and determining nitrites and nitrates together and nitrites alone are discussed.

A new method of detecting nitrites in drinking water, A. Rochaix (*Compt. Rend. Soc. Biol. [Paris], 66 (1909), No. 4, pp. 171, 172*).—The method proposed is based upon the blue coloration produced when a solution of tolylene red is added to water containing nitrous acid.

The estimation of urea in urine, S. R. Benedict and F. Gephart (*Jour. Amer. Chem. Soc., 30 (1908), No. 11, pp. 1760–1764*).—In the proposed method of the estimation of urea in urine, 5 cc. of urine and an equal volume of dilute hydrochloric acid (1 volume acid to 4 distilled water) are mixed in a wide test tube with the top covered by folding a piece of lead foil over it, and placed in a small autoclave heated to a temperature of 150° to 155° C. for about 1½ hours.

After cooling, the contents of the test tube are washed into a flask, diluted to about 400 cc., treated with 20 cc. of 10 per cent sodium hydroxid solution, and distilled for about 40 minutes into an excess of standard acid. The residue is determined and the urea nitrogen calculated after subtracting the previously determined ammonia nitrogen.

The author reports determinations which in his opinion show that the method is accurate.

The determination of total sulphur in urine, F. W. Gill and H. S. Grindley (*Jour. Amer. Chem. Soc., 31 (1909), No. 1, pp. 52–59*).—A critical study of the sodium peroxid method for the determination of total sulphur in urine, which according to the authors shows a loss of sulphur when such methods are used "and probably in fact where any alkaline fusion methods are used. . . . Experiments are now being made in this laboratory to determine the nature and extent of the losses, if any, occurring in the determination of sulphur in foods and feces. Results so far obtained show that the determination of the total sulphur in foods and feces by the method of procedure usually employed in the determination of total sulphur in urines gives fusions which more or less frequently evolve hydrogen-sulphid gas upon being acidified."

The identification of horse meat by the biological method, E. Baier and E. Reuchlin (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 9, pp. 513–520*).—On the basis of their investigations the authors conclude that this method is satisfactory for the detection of horse meat in dried sausage.

The identification of horse meat in sausage, A. Beihe (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 9, pp. 521–526*).—According to the author's studies, the chief difficulty in applying the biological method is the preparation of a suitable antiserum.

The accumulation of tyrosin in preserved liver, A. Beihe (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 9, pp. 525, 526*).—The presence of free tyrosin in preserved liver indicates decomposition and goods showing it should not be offered for sale.

The determination of malic acid in food products, H. W. Cowles, Jr. (*Jour. Amer. Chem. Soc., 30 (1908), No. 8, pp. 1285–1288; abs. in Chem. Abs., 3 (1909), No. 1, p. 83*).—A critical study of methods.

The estimation of tartaric acid in the presence of malic and succinic acids, L. Gowing-Scopes (*Analyst, 33 (1908), No. 389, pp. 315–319*).—A critical study of methods.

The determination of boric acid with iodin, M. L. Barthe (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1906–7, pp. 41, 42*).—The author believes that under the usual laboratory conditions it is not possible to determine boric acid satisfactorily with iodin in the presence of glycerin and mannit.

Résumé of the work of the International Commission for Uniform Methods of Sugar Analysis, E. G. Wiechmann (*Internat. Sugar Jour., 11 (1909), No. 123, pp. 124–133*).—A digest of data.

History, manufacture, and analysis of maple products, A. P. Sy (*Jour. Franklin Inst., 166 (1908), pp. 249–280; abs. in Chem. Abs., 2 (1908), No. 24, p. 3376*).—The history of maple sugar making, the botanical classification and distribution of sugar maple, the physiology of sap flow, and other similar matters are discussed and an account of the development of processes for the manufacture of maple products is given. The analysis of maple products is also considered, and experimental work carried on in an attempt to isolate flavoring substances present in maple sap is described.

The lead value of maple products, A. P. Sy (*Jour. Amer. Chem. Soc., 30 (1908), No. 10, pp. 1611–1616; abs. in Chem. Abs., 2 (1908), No. 24, pp. 3376, 3377*).—By lead value is meant the amount of lead in grams found in the pre-

cipitate formed by adding neutral lead acetate to 100 gm. maple sugar or 100 cc. sirup. Investigation showed that concordant results can be obtained if the method is followed closely, and pure and adulterated products are readily differentiated.

The method is as follows: To 50 gm. sugar, or 50 cc. sirup, add 200 cc. water, heat to boiling, add 20 cc. of a 10 per cent solution lead acetate (neutral), cover, heat again to boiling, let stand till cold, filter, and wash with 100 cc. water. Transfer filter and precipitate to a 400 cc. beaker and digest with 15 cc. HNO_3 and 10 cc. HCl until colorless; cool, add 10 cc. H_2SO_4, heat to fumes; cool, add 50 cc. water and 100 alcohol; determine $PbSO_4$, as usual. $PbSO_4 \times 1.366$=lead value, which should be not less than 0.250 and is usually over 0.300 for pure maple products.

The results of determinations made with 80 samples are given. See also a previous note (E. S. R., 18, p. 525).

The colorimetric estimation of benzaldehyde in almond extracts, A. G. Woodman and E. F. Lyford (*Jour. Amer. Chem. Soc., 30 (1908), No. 10, pp. 1607–1611*).—An adaptation of the fuchsin sulphurous-acid method to the estimation of small amounts of benzaldehyde is described.

"A number of test analyses have demonstrated the accuracy of the method and its convenience in the assay of commercial almond extracts. It is probable that it could be applied also to the valuation of almond oils."

The determination of aldehydes in oil of lemon, A. H. Bennett (*Analyst, 34 (1909), No. 394, pp. 14–17*).—A study of methods.

The detection of caramel in vanilla extract, A. G. Woodman and E. H. Newhall (*Tech. Quart., 21 (1908), No. 3, pp. 280–287; Chem. Abs., 3 (1909), No. 1, p. 86*).—Comparative tests of pure and specified vanillas showed that the use of absorptive reagents such as fuller's earth, or the removing of the natural color by selective solvents, is of little value. The best results are obtained with phenylhydrazin and paraldehyde.

A color reaction for mustard, T. Merl (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 9, pp. 526, 527*).—Note on the detection of curcuma and coal-tar dyes in mustard.

A doubtful color reaction, T. Merl (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 9, pp. 528, 529*).—Note on mustard analysis.

Decree relating to methods for analysis of wines, alcohol, brandies, and liqueurs (*Bul. Mens. Off. Renseig. Agr. [Paris], 7 (1908), No. 5, pp. 522, 523*).—Official methods are prescribed for determining the dry extract at 100° of ordinary wines and for the determination of impurities of alcohols, brandies, and liqueurs in accordance with the law of August 1, 1905.

Analysis of milks, G. Hinard (*Analyse des Laits. Paris, [1909], pp. 190, figs. 6*).—This handbook was written for the dairy chemist. Methods for the physical examination and the chemical analysis of normal and adulterated milks are described.

On the testing for ferments, especially in milk, S. Rothenfusser (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 1–2, pp. 63–74*).—The author reviews the various methods which have been proposed for ascertaining whether or not milk has been heated, and classifies them as follows: (1) Those which precipitate casein and fat by various agencies, (2) tests for oxidases, (3) tests for substances which decompose hydrogen peroxid, and (4) tests for reductases. There are also physical methods which are at present of little practical value. The methods included under (2) and (3) are more rapid than the others. Zink and Siegfeld's method of using guaiac is recommended. A modification of the Storch method is outlined, which can be used when various preservatives have been added to the milk.

On milk judging. H. R. CHRISTENSEN (*Tidsskr. Landökonomi, 1908, Nos. 11, pp. 555–560; 13, pp. 690–692*).—This paper contains a discussion of the reductase test as to the purity and keeping quality of milk, originally proposed by Neisser and Wechsberg. The results obtained by Barthel (E. S. R., 20, p. 12) are quoted at length.

A new reaction differentiating raw milk from heated (pasteurized) milk, as well as for the detection of hydrogen peroxid. W. P. WILKINSON and R. C. PETERS (*Jour. Dept. Agr. Victoria, 6 (1908), No. 4, pp. 251–253; Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 3, pp. 172–174; abs. in Rev. Gén. Lait, 7 (1908), No. 7, p. 162*).—This is a critical review of the methods which have been suggested for this purpose.

The authors also give the results of their experiments with benzidin according to the following method: "To 10 cc. of the milk to be tested are added 2 cc. of an alcoholic solution of benzidin, then 2 to 3 drops of glacial acetic acid (just sufficient to cause coagulation of the milk), shake the whole, and finally add 2 cc. of a 3 per cent solution of hydrogen peroxid. If the milk is unboiled or if it has not been heated to above 78° C., an intense blue coloration is immediately produced. Milk which has been heated to above 80° does not show any change by this treatment."

The advantages of using the benzidin test are that the reaction is more reliable than either the guaiac or potassium-iodid test, and more sensitive and intense than the paraphenylendiamin test. The reagent is also cheap and will keep for a long time. "The usefulness of benzidin as a test for unboiled milk may be extended by reversing the reaction and applying it as a very sensitive test for hydrogen peroxid."

The freezing point of milk as affected by the addition of water. P. FISCHER (*Pharm. Ztg., 53 (1908), No. 5, pp. 48, 49*).—The author found the freezing point of 100 samples of milk to vary from −0.54 to −0.58° C. Whenever water was added the freezing point was raised, and he concludes that the freezing point of milk will vary according to the percentage of water added to it.

The freezing point of milk. W. R. G. ATKINS (*Chem. News, 97 (1908), No. 2530, pp. 241, 242; Dairy, 20 (1908), No. 237, p. 238; abs. in Analyst, 33 (1908), No. 388, p. 279*).—The author found the mean freezing point of milk to be −0.55° C. and fairly constant, the variations rarely exceeding 0.03°. If milk is skimmed the specific gravity will be too high, but the freezing point will be unaffected, as fats have no effect on the freezing point. If water is added to bring the specific gravity to the correct value, the freezing point will be nearer that of pure water.

A contrivance for the determination of fat in milk by the Gottlieb-Röse method. E. RIETER (*Schweiz. Wchnschr. Chem. u. Pharm., 44 (1906), No. 12, pp. 170–172, fig. 1; Ann. Chim. Analyt., 14 (1909), No. 2, pp. 54–57, fig. 1*).—This is a description of a tube used in the author's modification of the Gottlieb-Röse method of determining the fat content.

The determination of fat in skim milk. R. LEZÉ (*Ann. Chim. Analyt., 13 (1908), No. 5, pp. 179, 180; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, p. 701*).—The author adds ammonia and sodium hydroxid to skim milk, which is then centrifuged and the portion containing the fat tested as in the case of whole milk.

A study of the Lezé process for the analysis of skim milk. R. LEZÉ, BOUTINES, and DUFLOS (*Rev. Gén. Lait, 7 (1909), No. 9, pp. 193–197*).—In order to overcome the variable results obtained in some cases by the Lezé method, noted above, the authors point out the conditions requisite for accurate determinations with this method.

A rapid method for the detection and estimation of formaldehyde in milk, H. S. Shrewsbury and A. W. Knapp (*Analyst, 34 (1909), No. 394, pp. 12–14*).—This is a paper presented at the meeting of the Society of Public Analysts and other Analytical Chemists at London, December 2, 1908.

The reagent used by the authors is made up of 1 cc. of pure nitric acid added to 100 cc. of hydrochloric acid. To 5 cc. of milk in a test tube 10 cc. of the freshly made reagent is added, shaken vigorously, and kept for 10 minutes in a water bath at 50° C. A violet color appears if formaldehyde is present and its intensity indicates the amount.

Disadvantages of potassium bichromate as a preservative, A. Monvoisin (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 25, pp. 1403, 1404; abs. in Jour. Soc. Chem. Indus., 28 (1909), No. 1, p. 36*).—The French law of August 1, 1905, requires that potassium bichromate be added to samples of milk taken for analysis. The author finds that after such addition the Storch test for heated milk can not be used. Potassium bichromate also interferes with the determination of the acidity, the cryoscopic point, the refractive index, and probably also the detection of formaldehyde.

The determination of the moisture content of butter, F. Bengen (*Ztschr. Untersuch. Nahr. u. Genussmtl., 17 (1908), No. 10, pp. 587–594; abs. in Hyg. Rundschau, 19 (1909), No. 1, p. 36*).—From a study of other investigators and his own experience in determining the moisture content of butter by drying in a Soxhlet apparatus, the author concludes that the present methods of determination by drying are not reliable, since some of the fatty acids are volatile and the result will be too high. The indirect method of subtracting the fat plus the solids-not-fat from 100 is recommended.

Studies on fatty acids in butter, R. K. Dons (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 12, pp. 705–725, dgms. 2*).—Continuing the researches previously noted (E. S. R., 19, p. 1111), the author has improved the methods for determining the amount of caproic, lauric, myristic, and other fatty acids of butter, which he describes in this article.

The Müntz-Coudon number in butters from the vicinity of Pavia, N. Monti (*Staz. Sper. Agr. Ital., 41 (1908), No. 5–6, pp. 370–382*).—The author used the Müntz-Coudon modification of the Polenske method in an examination of 76 samples of butter as to adulteration with other fats. A butter having a higher number than 13.36 is deemed free from coconut fat.

Artificial means of increasing the Reichert-Meissl value and saponification value of butter fat, H. Fincke (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, pp. 666–673; abs. in Analyst, 34 (1909), No. 395, pp. 50, 51*).—The author describes methods for the determination of acetin and triacetin when it is suspected that oils containing these glycerids have been added to fats for the purpose of imitating butter.

The determination of sugar in molasses feeds by polarization, F. Herles (*Ztschr. Zuckerindus. Böhmen, 32 (1908), No. 11, pp. 626–628*).—The author describes a method of determining the sugar content in molasses feeds which he has successfully used for the past 10 years.

Rapid determination of oil in cotton-seed products, C. H. Herty, F. B. Stem, and M. Orr (*Jour. Indus. and Engin. Chem., 1 (1909), No. 2, pp. 76–81*).—In this article the objections to the usual methods are enumerated and a new method is described, in which the objections are said to be met.

The higher melting point constituents of Japanese fish oil, H. Okada (*Chem. Ztg., 32 (1908), No. 99, pp. 1199–1201, figs. 2; abs. in Analyst, 34 (1909), No. 395, p. 62*).—A fish oil derived from several species of herring was found to have a melting point of 34 to 35° C. The saponification value was 195.9, the

iodin value was 29.7, and the refractometer reading at 41 to 42° C. was 1.4545. The oil was found to contain oleic acid and solid acids which appeared to be a mixture of stearic and isocetic acids.

Detection of savin oil, A. Beythien and P. Atenstädt (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, pp. 677–679; abs. in Analyst, 34 (1909), No. 395, pp. 63, 64*).—A note on methods for differentiating between savin oil, juniper oil, and turpentine.

Characteristics of ergot and lycopodium oils and areca-nut fat, A. Ratilje (*Arch. Pharm., 246 (1908), No. 9, pp. 692–709; abs. in Analyst, 34 (1909), No. 395, p. 64*).—Analytical data are given on these oils.

[Miscellaneous analyses], H. E. Annett (*Ann. Rpt. Dept. Agr. Bombay, 1907–8, pp. 27–31*).—This is the annual report of the official chemist and contains analyses of milk, cream, oil seeds, and other agricultural products.

[Miscellaneous analyses], J. Graftiau (*Rap. Lab. Anal. Louvain, 1906, pp. 17; 1907, pp. 16*).—These are the annual reports of the official chemist and contain analyses of fertilizers, feeding stuffs, and agricultural products.

[Miscellaneous analyses], T. F. Sedgwick (*Mem. Dir. Fomento [Peru], 1907–8, vol. 1, pp. 53–101*).—This is the annual report of the sugar cane experiment station for the year ending March 31, 1908. During the year 447 samples of soils, fertilizers, sugars, and other agricultural materials were analyzed.

[Miscellaneous analyses], J. McCrae (*Transvaal Govt. Labs. Ann. Rpt. 1907–8, pp. 5–21*).—This is the annual report of the government analyst and contains analyses of milk, meal, flour, water, and other agricultural materials.

METEOROLOGY—WATER.

Introduction to weather forecasting, W. J. van Bebber (*Anleitung zur Aufstellung von Wettervorhersagen. Brunswick, 1908, 2. rev. ed., pp. VI+38, figs. 16; rev. in Beibl. Ann. Phys., 33 (1909), No. 5, pp. 306, 307*).—A second revised edition of this pamphlet, which contains a brief popular discussion of the subject for the use of schools and farmers.

Constantly appearing secondary maxima and minima in the yearly course of meteorological elements, Van Rijckevorsel (*Konstant auftretende secundäre Maxima und Minima in dem jährlichen Verlauf der meteorologischen Erscheinungen. Rotterdam, 1908, pt. 5, pp. 14, fig. 1, charts 3; rev. in Beibl. Ann. Phys., 33 (1909), No. 5, p. 306*).—Temperature, pressure, and rainfall curves are traced and discussed.

The isothermal layer of the atmosphere and atmospheric radiation, E. Gold (*Proc. Roy. Soc. [London], Ser. A, 82 (1909), No. A551, pp. 43–70*).—The topics treated in this article are the phenomenon of the isothermal layer and the experimental evidence of its existence; the possible temperature distributions in an atmosphere; experimental data on gaseous radiation and absorption; and general expressions for the radiation from the atmosphere and conditions of its equilibrium as applied to an atmosphere of uniform constitution, the earth's atmosphere, taking into account the diminution of water vapor with height, and the day and night temperatures of the earth's surface.

The isothermal layer of the atmosphere, J. I. Craig, W. H. Dines, R. H. Hughes, and E. Gold (*Nature [London], 78 (1908), No. 2031, pp. 550–552; 79 (1909), Nos. 2045, pp. 281, 282; 2047, pp. 340, 341; 80 (1909), No. 2055, p. 68*).—The paper noted above is briefly discussed in this series of articles.

Recent observations in atmospheric electricity, P. H. Dike (*Amer. Jour. Sci., 4. ser., 27 (1909), No. 159, pp. 197–209*).—This is a paper presented before the Philosophical Society of Washington and is a critical review of recent work of investigators in this great field, which is said to be almost entirely neglected in this country.

The origin of atmospheric ozone and the causes of variation of carbon dioxid in the air, H. Henriet and M. Bouyssy (*Ann. Observ. Munic. (Observ. Montsouris) [Paris], 9 (1908), No. 1–2, pp. 167–195*).—This is a detailed account of investigations, a brief report of which has already been noted (E. S. R., 20, p. 422).

Analyses of air, P. Miquel (*Ann. Observ. Munic. (Observ. Montsouris) [Paris], 9 (1908), No. 1–2, pp. 7–28*).—Numerous determinations of ozone and carbon dioxid in the free air and more detailed examinations of the confined air of subways, tunnels, and buildings are reported.

[Meteorological observations in Trinidad], J. H. Hart and H. Millen (*Bot. Dept. Trinidad Ann. Rpt. 1908, pp. 24, 25, 32–37*).—Tables are given which show the monthly and annual rainfall at the Royal Botanic Gardens from 1862 to 1907; mean annual barometric pressure, temperature, and rainfall at the same place, 1888 to 1907; and observations on rainfall during 1907 at 56 stations in Trinidad; besides miscellaneous meteorological observations during that year at various stations in the island. The mean annual rainfall at the botanic gardens, 1862 to 1907, was 72.39 in.; for 20 years, 1888 to 1907, 66.6 in. The mean barometric pressure for the 20 years, 1888 to 1907, was 29.96 in.; the annual temperature 78.50.

The rainfall in Natal, E. Nevill (*Natal Agr. Jour., 11 (1908), No. 12, pp. 1531–1533*).—Attention is called to the fact that there is a distinct 18-year periodical fluctuation in rainfall in Natal, the epochs of heaviest rainfall centering around the years 1855–56, 1873–74, and 1892–93. The indications point to a similar exceptionally heavy rainfall centering around the year 1910–11. The excess of rain is usually spread over a period of about 5 years. These periods of excessive rainfall are attributed to the gradual northerly drift of the great rain belt, the normal position of which is to the southeast of Cape Colony.

It is noted also that these epochs of heavy rainfall coincide "with that of the approach of the node of the moon's orbit to the position of the vernal or spring equinox, when the inclination of the plane of the moon's orbit to the plane of the terrestrial equator reaches its maximum value, as if there were some connection between the two occurrences, and this coincidence points to a possible cause of this 18-year fluctuation in the rainfall. . . . If the great rain belt has any tendency to follow the deformation of the atmosphere under the attraction of the moon, as it should according to theory, then the greatest northerly drift will occur when the moon's node approaches the vernal equinox, and this is exactly what is indicated by the observations. It is to be noted that this is purely a local cause affecting Southeast Africa, and not necessarily holding of any other place. . . .

"It is noteworthy that three 11 or 12 year solar periods of variation in density of rain belt are not very different from two 18-year lunar periods, so that every 35 or 36 years the two should coincide and give rise to a specially heavy excess of rain, similar to that which is recorded by the observations. Thus the excess of rainfall near 1855–56 and 1892–93 was much heavier than that at the intermediate 18-year epoch in 1873–74. If this be so, the coming heavy rains of 1910–11 will not be so heavy as those of either 1855–56 or 1892–93."

Contributions to hydrology, H. Dessoliers (*Contributions Diverses à l'Hydrogeuèse. Algiers, 1908, pp. 168, pls. 4, figs. 4*).—This is a series of articles treating of sources and means of conserving and increasing the water supply.

Underground waters of Georgia, S. W. McCallie (*Geol. Survey Ga. Bul. 15, pp. 370, pls. 29, figs. 5, map 1*).—This report has an introductory chapter on the general conditions controlling the amount of water taken up by soils, discusses briefly the physiography and geology of Georgia, and takes up in detail

the amount, composition and other characteristics of the underground water by geological formations and by counties. The report is in part a revision of a paper on the artesian well system of Georgia, published in 1898.

Dew ponds, G. Hubbard (*Jour. Roy. Soc. Arts, 57 (1909), No. 2937, pp. 330–340*).—The article tells what dew ponds are, explains the conditions essential to their efficient action, and discusses the possibility of their introduction with advantage into arid regions. Accurate data are too limited to draw positive conclusions as to the latter point. See also a previous note (E. S. R., 17, p. 533).

A phase of ground water problems in the West, W. C. Mendenhall (*Econ. Geol., 4 (1909), No. 1, pp. 35–45, figs. 2*).—This article is based upon observations on "the relation of the withdrawals of ground water by artificial means to the recharge from precipitation and run-off" in the San Bernardino Valley, California, "where, during 8 or 9 years past, the total developed waters and the total waters that rise naturally in springs have been measured twice annually. The total water from both these sources, all of which is used for domestic purposes or for irrigation, has increased slowly, although irregularly, to keep pace with the increasing population of the dependent communities, but the most striking fact brought out by the measurements is the general increase in the amount of developed water, accompanying an equally marked general decrease in the natural waters; that is to say, the flow of springs has lessened markedly as the yield of wells has increased. . . .

"Detailed measurements have not been made for other of the many basins that together constitute the valley of southern California, but there is no doubt that were they to be had they would indicate about the same condition that exists in the San Bernardino basin."

The need of "constant records of fluctuations in ground water levels, for comparison with the average rainfall, or the average flow of the supplying stream," is emphasized.

The presence of nitrites and ammonia in drinking water, S. Van Eyk (*Pharm. Weekbl., 45 (1908), No. 41, pp. 1162–1165; abs. in Chem. Abs., 3 (1909), No. 6, p. 682*).—The occurrence of considerable amounts of nitrites in water from a zinc-lined pump is reported. An investigation of the matter indicated that the nitrites were due to the reduction of nitrates by the zinc.

The removal of iron from well water, Peters (*Ztschr. Hyg. u. Infektionskrank., 61 (1908), No. 2, pp. 247–261; abs. in Chem. Abs., 3 (1909), No. 6, p. 682*).—The method proposed is to pour into the well water which has been standing for some time in the open air and has become thoroughly aerated. The iron is precipitated by the oxygen thus introduced and the water may be pumped out and filtered.

The purification of ground waters containing iron and manganese, R. S. Weston (*Proc. Amer. Soc. Civ. Engin., 34 (1908), No. 10, pp. 1324–1393, pls. 3, figs. 8; 35 (1909), No. 2, pp. 150–166, fig. 1; abs. in Engin. Rec., 59 (1909), No. 6, pp. 146–148, fig. 1; Engin. Digest, 5 (1909), No. 3, pp. 251–256*).—This article explains that the method of deferrization which it is advisable to use in any given case depends upon the composition and character of the water. A careful study of the water is therefore a necessary preliminary to the application of efficient methods. Methods which have been employed with success are described. The most important feature of all of these methods is thorough aeration.

Chemical purification of drinking water in the country, J. Laurent (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 9, pp. 392, 393; abs. in Rev. Sci. [Paris], 47 (1909), I, No. 5, p. 150*).—Directions are given for the application of a method based upon the use of permanganate of potash and alum followed by the addition of sodium hyposulphite and carbonate.

The recent Parisian experiments on water sterilization by ozone, C. Daage (*Engin. Rec., 59 (1909), No. 7, p. 183*).—Experiments with Siemens-de Frise ozonizers are reported. The treatment was found to be very effective in destroying organisms in the water.

On the sterilization of potable water by means of the mercury vapor lamp, J. Courmont and T. Nogier (*Compt. Rend. Acad. Sci. [Paris], 148 (1909), No. 8, pp. 523, 524*).—Experiments are reported which show that by the use of the Kromayer mercury vapor lamp complete sterilization can be secured in from 1 to 2 minutes, even when the samples are very highly polluted.

Examinations of water, P. Miquel (*Ann. Observ. Munic. (Observ. Montsouris) [Paris], 9 (1908), No. 1–2, pp. 29–62*).—Detailed examinations of potable waters of Paris and environs, sewage and drainage waters, and rain water are reported.

SOILS—FERTILIZERS.

The soil, A. D. Hall (*London, 1908, 2. ed., rev. and enl., pp XV+311, pls. 13, figs. 4*).—This is a second revised and enlarged edition of this work, which is described as an introduction to the scientific study of the growth of crops. The principal changes which have been made are a revision of the method of mechanical analysis of soils, modification of the author's views on the nature of clay and on the absorption of ammonium and other salts by zeolitic silicates in the soil, and enlargement and complete revision of the chapter on the living organisms of the soil, besides numerous minor corrections and modifications.

The genetic classification of soils, N. Tulaikov (*Jour. Agr. Sci., 3 (1908), No. 1, pp. 80–85*).—This is a brief description of the genetic classification of soils as worked out by Dokouchayev and Sibertzev in Russia (E. S. R., 12, pp. 704, 807; 19, p. 314) and partially adopted by Hilgard and Ramann.

In this classification the word soil is taken to mean "the loose surface strata of the earth's crust in which general dynamic processes (weathering, erosion, etc.) have taken place, and are taking place in conjunction with chemico-biological processes." The classification includes 7 types, as follows: Laterite soils, wind-blown loess soils, soils of the dry steppe, black soils (chernozem), gray soils, peat and ashy (podzol) soils, and fenland (tundra) soils. These 7 fundamental groups of soils "are spread over the surface of large continents in zones which coincide with the physico-geographical zones of those continents."

It is stated that notwithstanding the seeming complexity of this classification, "its fundamental feature is the general statement that soil is the product of the conditions of its development, and that the peculiarities of soils are closely interrelated."

Soil investigations, I, K. O. Björlykke (*Tidsskr. Norske Landbr., 15 (1908), No. 11, pp. 496–504*).—A discussion of the principles underlying the problem of soil studies. In this article considerable attention is given to American work in this line, particularly to that of Hilgard.

Biochemical studies in forest soils, R. Albert and A. Luthier (*Jour. Landw., 56 (1908), No. 4, pp. 347–370; abs. in Chem. Zentbl., 1909, I, No. 7, p. 572*).—The studies, which were made with four diluvial forest soils, included determinations by Remy's method of putrefactive capacity under different conditions of season and water supply, nitrifying power by the Buhlert and Fickendey method, fermentative power for soluble carbohydrates by the Remy method, and physical and chemical examinations of the soils. The studies reported are considered preliminary to further investigations and therefore few con-

clusions are drawn. The results in general indicate the usefulness of Remy's methods of study.

A certain parallelism was observed to exist between biological activity and the carbohydrates, lime, mineral matter, and fine particles of the surface soil. The character of the humus appeared to be of more importance than its total amount. Determinations of absorptive power for nitrogen according to Knop's method and of hygroscopicity according to Mitscherlich's method proved of value in judging the character of the soils. Determinations of free acids in humus by Süchting's method were found to be of little value.

Chemico-agricultural study of the soils of Poggiomarino, S. de Grazia (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 7 (1907), pp. 26*).—Poggiomarino is a district in the province of Naples, its soils being of volcanic origin. The mechanical analysis, litho-mineralogical analysis of the coarse material, physico-chemical analysis (Schloesing), and a brief chemical analysis of soil from seven points in the region are given and discussed at considerable length. In general the soil of the region may be classified as fertile.

A remarkable accumulation of nitrogen, carbon, and humus in a prairie soil, F. J. Alway and C. E. Vail (*Jour. Indus. and Engin. Chem., 1 (1909), No. 2, pp. 74–76*).—Analyses of 2 types of soil, bowlder clay and lacustral clay, from the experimental farm at Indian Head are reported. The samples of lacustral clay were taken from the summits of hummocks which are a characteristic feature of the area under consideration, as well as from rifts between the hummocks. No marked difference was observed in the composition of the till and the soil from the summits of the hummocks. The rifts, however, contained more than twice as much humus (7.18 per cent), humus nitrogen (0.46 per cent), total nitrogen (0.84 per cent), and carbon (10.59 per cent) as the soil from the tops of the hummocks.

Soil acidity in its relation to lack of available phosphates, C. W. Stoddart (*Jour. Indus. and Engin. Chem., 1 (1909), No. 2, pp. 69–74; abs. in Jour. Soc. Chem. Indus., 28 (1909), No. 6, p. 320*).—In a previous paper (E. S. R., 18, p. 1024; 19, p. 17) it was shown that acid soils are as a rule in need of phosphates.

Further study of typical acid and neutral soils, more particularly the relation of phosphoric acid to humus, showed that the phosphoric acid content of the humus was about the same in both acid and nonacid soils. The acid soils contained a higher percentage of total phosphoric acid in combination with iron and aluminum and less in combination with calcium than the nonacid soils.

Some of the results obtained indicate that the phosphorus of humus may not be available to plants. Fifth-normal nitric acid was found to be an excellent indicator of soil needs with respect to phosphates, due to the fact that it determines with accuracy the amount of calcium phosphate in soils. The general conclusion is reached that as far as Wisconsin soils are concerned, when the percentage of phosphoric acid soluble in fifth-normal nitric acid falls below 0.015 the soils will respond to phosphate fertilizer.

The problem of our unproductive lands, T. Cherry (*Jour. Dept. Agr. Victoria, 7 (1909), No. 1, pp. 18–25*).—The lands referred to include "first approximately 4 million acres of the inferior and poor parts of the Mallee; second, at least double that area of hilly country forming the main part of the Great Dividing Range and its northern and southern spurs; and third, perhaps million acres of the sandy land along the coast. The total area is at least one-fourth of the entire extent of Victoria."

The composition of the soil of these areas as compared with that of other parts of Victoria is shown in the following table:

Results of analyses of Victorian soils.

	Nitrogen.	Phosphoric acid.	Potash.
	Per cent.	*Per cent.*	*Per cent.*
Rich western district land	0.250	0.150	0.300
Average northern wheat land	.110	.065	.300
Average coastal plain land	0.040– .350	0.010– .100	0.010– .150
Average hill soils	.025– .150	.040– .080	.100– .300
Average Mallee soils	.025– .200	.005– .100	.200–1.000

One prominent physical characteristic of these soils is the very slight difference between surface soil and subsoil. Potash is as a rule very abundant in the soils and nitrogen is generally fairly abundant, but phosphoric acid is deficient. Lime is a prominent constituent, in many cases running as high as 10 to 25 per cent. Practical trials indicate that the use of manure and phosphates and thorough cultivation are among the most efficient means of improving these soils.

On the effect of various mulching materials on the productiveness of soils. CLAUSEN (*Illus. Landw. Ztg., 28 (1908), No. 99, p. 846; abs. in Chem. Abs., 3 (1909), No. 6, p. 684*).—Comparative tests of sand, peat, and sawdust are reported. It was found that the use of an amount of peat corresponding to only 1.6 per cent of the amount of soil increased the yield about 25 per cent.

Fixation of free nitrogen, nitrification, etc., A. KOCH (*Jahresber. Gärungs-Organismen, 16 (1905), pp. 352–389*).—This is a review of investigations reported during 1905 on fixation of free nitrogen, denitrification, nitrification, and related subjects, more particularly fermentative changes occurring in manure.

Contribution to the knowledge of the chemical processes involved in the assimilation of free nitrogen by Azotobacter and Radiobacter, J. STOKLASA ET AL. (*Centbl. Bakt. [etc.], 2 Abt., 21 (1908), Nos. 15–16, pp. 484–509; 20–21, pp. 620–632, pls. 3; abs. in Jour. Chem. Soc. [London], 94 (1908), Nos. 552, II, p. 880; 533, II, p. 975; Jour. Soc. Chem. Indus., 27 (1908), No. 23, p. 1167*).—This article discusses the morphology and biology of *Bacillus radiobacter* in the light of recent investigations, and reports investigations on the isolation of this organism and to test the behavior of Azotobacter and Radiobacter in mixed and pure cultures; the rate of nitrogen fixation of mixed and pure cultures of the 2 organisms; the influence of different kinds of carbohydrates on nitrogen fixation; the behavior of the organisms in the presence of sodium nitrate; the consumption of carbohydrates in the assimilation of free nitrogen by *Azotobacter chroococcum;* the intensity of respiration of *A. chroococcum;* chemical processes involved in the breaking down of glucose and mannite by the respiration enzym of Azotobacter; the metabolism balance of *A. chroococcum*, Beijerinck; production of hydrogen in the metabolic processes of *A. chroococcum*, B.; behavior of phosphorus of various phosphatic nutrients in the Azotobacter mass; nuclein in the bacterial mass of *A. chroococcum* and in the organism itself; and chemical analysis of the bacterial mass of *A. chroococcum* B.

It is shown that these organisms are widely distributed in nature and are especially abundant in soils having vigorous growth of blue-green algæ. They do not occur, however, in high-lying soils of the Alps. Radiobacter has only a slight power of fixing nitrogen as compared with Azotobacter, and the fixing

power of the latter is but slightly increased by symbiosis with Radiobacter. Of the sugars tested as sources of carbonaceous food of the organisms, l-arabinose gave the best results, and rhamnose the poorest. With dextrose 99 to 224 gm. of sugar was converted into carbon dioxid for every gram of nitrogen fixed. The results obtained with the various sugars suggest that the furfuroids of the soil are the best source of food for Azotobacter. Nitrate of soda inhibited nitrogen fixation, but apparently was not as good a food as free nitrogen. It was found that nitrite and ammonia were invariably formed when nitrate of soda was used in the culture medium. Radiobacter was shown to be a powerful denitrifier, liberating free nitrogen from nitrate and exhibiting intense respiration.

Analysis of the bacterial mass produced in the cultures showed ash 8.6 per cent, phosphoric acid 4.9 per cent, potash 2.4 per cent, and nitrogen 11.3 per cent.

Nitrogen and nitragin, A. J. Ewart (*Jour. Dept. Agr. Victoria, 7 (1909), No. 1, pp. 36–39*).—This article discusses briefly the nature and use of commercial cultures of organisms which assimilate free nitrogen, and explains the conditions under which such cultures are likely to be beneficial. The general conclusion is that in the present state of knowledge of the subject the use of these cultures is not to be recommended except under "very special conditions." "The net result of the activity of soil bacteria in rich, well-manured soils is to produce a loss rather than a gain of nitrogen, and hence no advantage is to be expected by the addition of cultures of any kind of bacterium to such soils."

The inoculation of leguminous crops, F. J. Chittenden (*Jour. Roy. Hort. Soc. [London], 34 (1908), No. 2, pp. 231–254, pl. 1, fig. 1; 34 (1909), No. 3, pp. 491–499*).—In experiments at Wisley Garden in 1908 with peas treated with the inoculating material prepared by Professor Bottomley of Kings College, it was found in one series of experiments that "7 out of the 12 plats on which inoculated seed was sown gave smaller crops than the corresponding uninoculated plats, and one gave an equal crop. . . . The crop from the inoculated seed was not better in any way than that from the uninoculated, nor did it reach maturity earlier." In a second series of experiments "only 7 out of 24 rows of inoculated seed gave a greater yield than the uninoculated, one gave an equal yield, and 16 gave a smaller."

Watering peas with the inoculating material gave like results.

The general conclusion drawn is that the inoculation of leguminous crops with the material used is not likely to prove beneficial in ordinary garden soils.

Experiments on the value of nitro-bacterine, C. T. Gimingham (*Gard. Chron., 3. ser., 45 (1909), No. 1152, pp. 59, 60*).—Experiments with peas on very poor and on well manured garden soil at the Southeastern Agricultural College, Wye, are reported. "There was no evidence of any kind to show that the slightest benefit had been obtained by the use of 'nitro-bacterine' on either type of soil."

Experiments on the value of nitro-bacterine, F. Keeble (*Gard. Chron., 3. ser., 45 (1909), Nos. 1150, pp. 20, 21; 1151, pp. 35, 36*).—The results obtained by Chittenden (noted above) are discussed, and experiments of a similar character made on the grounds of the botanical laboratory of University College, Reading, are reported.

It was found in these experiments that the increase of yield from inoculated seed was so small that it did not represent a sufficient increase of profit to make the use of nitro-bacterine on ordinary garden soils of practical value. To this extent the results confirm those reported by Chittenden, but they do not confirm the conclusion that inoculation generally decreases the yield.

Experiments on the value of nitro-bacterine, F. J. Chittenden (*Gard. Chron., 3. ser., 45 (1909), No. 1153, pp. 68, 69*).—Attention is called to certain errors which occurred in a previous report tending to exaggerate the reduction in yield from inoculated seed.

Nitro-bacterine, G. Henslow (*Gard. Chron., 3. ser., 45 (1909), No. 1154, p. 92*).—Beneficial results from watering scarlet runner beans with culture solutions of the "nitro-bacterine" are reported.

Experiments with nitro-bacterine, W. B. Bottomley (*Gard. Chron., 3. ser., 45 (1909), Nos. 1154, pp. 91, 92; 1156 p. 114*).—Referring to experiments at Wisley, Wye, and Reading, noted above, the author calls attention to conditions of soil and fertilizing in those experiments which in his judgment account for the unfavorable results obtained.

Investigations on lime nitrogen and nitrogen lime, A. Sabaschnikoff (*Mitt. Landw. Inst. Leipzig, 1908, No. 9, pp. 77–123; abs. in Chem. Ztg., 33 (1909), No. 43–44, Repert., p. 202*).—Previous investigations on this subject are reviewed and laboratory investigations on decomposition in soil and fertilizer experiments in the field are reported, as well as investigations on the character and work of the bacteria which cause decomposition of lime nitrogen. Among the more important results obtained were the following:

It was again shown that a culture medium consisting of soil extract, 0.5 per cent of acid potassium phosphate, 0.1 per cent of asparagin, and 0.1 per cent of grape sugar furnishes a very good medium for decomposition experiments with lime nitrogen and nitrogen lime. Formation of ammonia occurs in media which do not contain asparagin and grape sugar, but the formation in this case is very slow. Heating the lime nitrogen solution produced no injurious effect, but to a certain extent promoted the formation of ammonia. Neither on heating nor on standing was dicyandiamid formed in lime nitrogen solutions. The substance produced by heating is very easily decomposed. It is apparently an isomer of dicyandiamid.

Carbon dioxid does not cause the formation of dicyandiamid. It does not retard, but to some extent promotes the cleavage of cyanamid. Calcium cyanamid solutions which had not been heated were decomposed by pure cultures of bacteria only when absorbent substances were present. This fact is of great importance with respect to the action of lime nitrogen and nitrogen lime on soils of low absorptive capacity, and the mixing of these substances with compost appears to be advisable in such cases.

The intensity of the cleavage of cyanamid varied widely in the same soil in the course of the year, depending more upon the time of the year than upon the weather. The nitrogen of lime nitrogen and nitrogen lime was converted in like amount into ammonia and its decomposition was brought about by the same bacteria. Among the very active organisms in the cleavage of cyanamid was *Bacterium erythrogenes*, which also is active in the cleavage of urea.

The chemical changes in lime nitrogen when used as a fertilizer, H. Kappen (*Centbl. Bakt. [etc.], 2. Abt., 22 (1908), No. 7–10, pp. 281–298; abs. in Chem. Zentbl., 1909, I, No. 4, pp. 310, 311*).—This is a further contribution to a controversy with Löhnis on this subject (E. S. R., 20, p. 123).

The decomposition of lime nitrogen, III, F. Löhnis and R. Moll (*Centbl. Bakt. [etc.], 22 (1908), No. 7–10, pp. 254–281; abs. in Chem. Zentbl., 1909, I, No. 4, p. 310*).—This article reviews previous observations and hypotheses relating to the decomposition of lime nitrogen, referring more particularly to the work of Kappen (E. S. R., 18, p. 1028) and reports further studies by the authors on the hydration of cyanamid, the influence of the soil on the decomposi-

tion of lime nitrogen, the formation and decomposition of dicyandiamid, and the relation of bacteria to the decomposition of lime nitrogen.

The authors conclude from their investigations that the decomposition of lime nitrogen in the soil takes place in the following way: By solution the calcium cyanamid is converted into calcium dicyandiamid $(CN.NH)_2Ca$. On standing of the solution, or more quickly under the influence of heat or the absorptive power of the soil particles, the lime of the cyanamid is set free. The cyanamid under the action of weak acids (carbon dioxid) or heating in the presence of basic substances (caustic lime) is converted into ammonium cyanate and finally into urea, the latter being converted into ammonium carbonate by the action of bacteria.

As Ulpiani found, there is no direct bacterial action on cyanamid. Bacteria do not attack dicyandiamid either in dilute or concentrated solution. In experiments on the decomposition of lime nitrogen in which soil is used it makes no difference whether the solution is heated or not.

Is dicyandiamid a poison for field crops? O. Loew (*Chem. Ztg., 33 (1909), No. 3, pp. 21, 22; abs. in Jour. Chem. Soc. [London], 96 (1909), No. 556, II, p. 177; Chem. Zentbl. 1909, I, No. 9, p. 785; Chem. Abs., 3 (1909), No. 10, p. 1197*).—Pot experiments with barley on humus garden soil, comparing dicyandiamid (0.75 gm. to 3.5 kg. of soil) on sterilized and unsterilized soil, ammonium sulphate, and no nitrogenous fertilizer, are reported.

The results showed that on sterilized soil dicyandiamid gave the same yield as ammonium sulphate. On unsterilized soil the growth of the plants was seriously interfered with as a result, in the author's opinion, of the formation of injurious compounds from the dicyandiamid through the action of the bacteria. It was noticed in the case both of sterilized and unsterilized soil that the use of dicyandiamid resulted in a drying up of the tips of the leaves of the barley, a result attributed to the excessive accumulation of the dicyandiamid in that part of the plant.

The structural formula of the dicyandiamid is discussed.

An observation on calcium cyanamid, J. Aeby (*Chem. Ztg., 33 (1909), No. 17, p. 145; abs. in Ztschr. Angew. Chem., 22 (1909), No. 15, p. 687*).—It is reported that a loss of 1.1 per cent due to the formation of acetylene was observed in a lot of calcium cyanamid left exposed to damp air on the wharves at Antwerp. This is attributed to excess of calcium carbid in the material resulting from imperfect methods of manufacture, and it is suggested that a guaranty of the content of this substance should be required in case of calcium cyanamid intended for extended transportation.

The assimilation of potash by plants, W. Krüger (*Ztschr. Ver. Deut. Zuckerindus., 1908, No. 631, II, pp. 739–750; Jahrb. Deut. Landw. Gesell., 23 (1908), No. 4, pp. 633–649; abs. in Chem. Abs., 3 (1909), No. 3, p. 350*).—Fertilizer experiments with sugar beets, rye grass, chicory, barley, rye, peas, potatoes, and other plants are reported, and the factors influencing the assimilation of potash are discussed. These are variety of plant, character and quality of soil, fertilizer, weather, etc., and the micro-organisms of the soil. Attention is called to the importance of the return of fertilizing constituents from the plant to the soil during the period of growth. The effect of good fertilization in offsetting injury from nematodes is emphasized. Lack of potash in the culture of sugar beets was not shown until the reserve of potash in the root had been consumed, when further development was checked.

Phonolith, so-called potash silicate, as a fertilizer, P. Wagner (*Mitt. Deut. Landw. Gesell., 24 (1909), No. 2, pp. 19, 20*).—Comparative tests of this material and of sulphate of potash on grass and tomatoes on sandy soils are reported, the results showing that the rock meal furnished so little assimilable

potash that the potash-hunger of the plants was not satisfied. Apparently the potash of this material was very resistant to the solvent action of acids, soils, and plant roots.

On the fertilizing value of the phosphoric acid of vivianite, O. Böttcher (*Deut. Landw. Presse, 36 (1909), No. 7, p. 61; abs. in Chem. Ztg., 33 (1909), No. 25, Repert., p. 118*).—An impure vivianite derived from swamp deposits containing 15.02 per cent of phosphoric acid and 18.1 per cent of water was compared with superphosphate in pot experiments with oats. Taking the efficiency of superphosphate as 100, that of the vivianite was 22 to 30. The phosphoric acid is slowly available and the material has some fertilizing value, but not sufficient to pay for long transportation or much handling.

The phosphorites of Gafsa, Tebessa, and Cape Leuca, R. Rossi (*Ann. R. Scuola Sup. Agr. Portici, 2. ser., 7 (1907), pp. 16*).—The physical characteristics of phosphorite from these places are given, as well as a description of the preparation of the samples, processes of analysis, and tables showing the results of the analyses.

The average percentages of calcium phosphate shown by the analyses were: Gafsa phosphorite 56.48, Tebessa phosphorite 43.53, and Cape Leuca phosphorite 17.31. The percentages of calcium carbonate in the phosphates were high, being 15.56 in case of Gafsa phosphorite, 36.39 in Tebessa phosphorite, and 70.73 in Cape Leuca phosphorite.

Namban Creek phosphatic deposits, E. A. Mann et al. (*Jour. Dept. Agr. West. Aust., 17 (1908), Nos. 5, pp. 805–810; 6, pp. 980–982*).—Deposits of phosphatic guano occurring in caves in this district are described and analyses are reported showing phosphate of lime varying from 26.6 to 45.25 per cent, and nitrogen from 0.2 to 1.65 per cent. The larger proportion of the phosphoric acid was found to be soluble in citrate solution.

Phosphatic and gypsum deposits, A. Despeissis (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 6, pp. 906, 907*).—Statistics of the consumption of fertilizers in Western Australia are given, with notes on deposits of phosphate and gypsum which have been discovered in that colony. It is stated that 16,486 tons of fertilizers were imported into Western Australia during the half year ended June 30, 1908. The occurrence of extensive deposits of both phosphate and gypsum is reported.

The present status of the nitrate industry of Chile, Gerlach (*Ztschr. Agrarpolitik, 7 (1909), No. 1, pp. 10–18*).—This article discusses the present and probable future supply of nitrate and the present business problems and organization of the industry.

The Chilean nitrate fields (*Mark Lane Express, 100 (1909), No. 4036, p. 119*).—Reference is here made to the report of the Chilean government inspector of nitrate, which states that the minimum stock in sight is 220,000,000 tons and that there is no danger of a failure of supply for a century at least.

Analyses of fertilizers, R. E. Rose (*Fla. Quart. Bul. Dept. Agr., 19 (1909), No. 1, pp. 1–6, 12–27, 31–35, 46–80, 133–161*).—The results of inspection of fertilizers during the year 1908 are reported, with the laws providing for this work and the rules and regulations adopted under the laws, and suggestions regarding the purchase and use of fertilizers. It is stated that inspection tags covering 133,224 tons of commercial fertilizers were sold during the year. This represents an increase of 8,618 tons.

Comparing the economy of high-grade and low-grade fertilizers, it is stated that "the high-grade fertilizers, for but little more than a third advance in price over the cost of the low-class goods, furnish two-thirds more plant food and five-sixths more commercial value." Those who require low-grade goods

are advised to purchase the necessary materials and have them mixed and bagged at the factory.

Commercial fertilizers. T. L. CALVERT (*Off. Rpt. Sec. Ohio Bd. Agr. on Com. Ferts., 1908, pp. 86*).—This is a report in the usual form on inspection of fertilizers licensed and analyzed in Ohio during the year 1908. The report also contains notes on trade values of fertilizer ingredients during the year and the text of the new fertilizer law which went into effect November 1, 1908.

AGRICULTURAL BOTANY.

Linnaeus's lectures on the cultivation of plants, M. B. SWEDERUS (*Uppsala Univ. Aarsskr. 1907, Linnéfest Skr. 1, pp. VIII+107*).—This is a translation into German of a series of lectures on the cultivation of plants that are supposed to have been delivered by Linnaeus at the University of Upsala about 1759. The manuscript was found in St. Petersburg a few years ago.

The weeds and suspected poisonous plants of Queensland, F. M. BAILEY (*Brisbane, 1906, pp. 245, figs. 408*).—Brief botanical descriptions are given of the orders, genera, and species of weeds and suspected poisonous plants of Queensland. In each instance the locality is named from whence the specimens were obtained and notes are given regarding their economic, noxious, medicinal, and other properties. With a few exceptions, a portion of each plant is illustrated.

Triple hybrids, H. DE VRIES (*Bot. Gaz., 47 (1909), No. 1, pp. 1–8*).—An account is given of studies of evening primrose hybrids in which the possibilities of so combining the species as to form triple and even quadruple hybrids are described. The author states that twin hybrids are produced when the pollen of *Œnothera lamarckiana* or of one of its derivatives is crossed with the European subspecies of *Œ. biennis* or of *Œ. muricata*. Triple hybrids may be produced by combining one of these with species such as *Œ. lata* and *Œ. scintillans*. The segregation of characters in the progeny is discussed.

The chemistry of plants, G. ANDRÉ (*Chimie Végétale. Paris, 1909, pp. XII+560, figs. 14*).—This is issued as a portion of Encyclopédie Agricole, published under the direction of G. Wery. While essentially an elementary work, the author designed this treatise for those who want to gain something more than a superficial knowledge of the processes of plant nutrition.

Chapters are given on the essential elements, structures, and function of vegetable material in general, after which the function of chlorophyll, formation of intermediate ternary compounds, assimilation and elaboration of nitrogen, chlorophyll and other plant pigments, germination, respiration, mineral composition, the forms under which various mineral substances are found in plants, and the rôle of water in the plant kingdom are discussed.

While the treatment is popular in its nature, the author has incorporated the results of many recent investigations and states the more recent theories on plant life and processes.

The bio-chemistry of animals and plants, O. ROSENHEIM (*Sci. Prog. Twentieth Cent., 2 (1908), No. 8, pp. 676–699; 3 (1908), No. 9, pp. 106–123*).—This is a summary giving the present status of the bio-chemistry of plants and animals, the first part of the paper being devoted to a discussion of the nitrogen cycle, including nitrification, denitrification, and nitrogen fixation, the synthesis of proteids, and the history, occurrence, properties, classification, etc., of proteids. In the second portion of the paper the significance of proteids in the plant is discussed, and the occurrence and function of a number of other compounds, such as phytotoxins, toxolecithides, lipoids, inosite, organic phosphoric

acids, etc., are described. The author concludes with a discussion of chlorophyll and its relation to hemoglobin.

Some problems and results of a study of the mechanics of plant anatomy, E. Küster (*Prog. Bot., 2 (1908), No. 4, pp. 455–558, figs. 24*).—The author discusses some of the problems of cell and tissue development in plants, the paper being based upon lectures given at the University of Halle in 1907. The literature of the subject is quite extensively reviewed.

The effects of variations in the inorganic salts and the reactivity of the external medium upon the nutrition, growth, and cell division in plants and animals, B. Moore, H. E. Roaf, and R. E. Knowles (*Bio-Chem. Jour., 3 (1908), No. 6–8, pp. 279–312, pls. 4*).—The results of experiments with acid and alkaline salts on the growth, cell division, etc., of various plants, and their effects on certain animals are described. The inorganic salts used were sodium hydrate, hydrochloric acid, potassium hydrate, sodium carbonate and bicarbonate, monosodium phosphate, and disodium phosphate. The plants experimented with were hyacinths and onions, the various solutions being made up on the basis of gram-molecular strengths.

Marked effects were produced upon the dividing cells of plant rootlets by small variations in the alkalinity or acidity of the medium. The range of ionic concentrations compatible with plant growth was a very narrow one. Short of the lethal dose there was found a marked stimulation by the alkali which was not found with the acid. The kation present appeared to have a specific effect, and potassium was more stimulating than sodium to both rootlets and foliage leaves. The phosphatic anion had a special effect upon the flower, causing an increase in size at optimum strength. At higher concentrations, irregular inflorescences with packed florets on dwarfed stalks were obtained.

The cytological effects of the different inorganic salts were studied, and there was found to be an absence or depression of nuclear division with the acid, and a thickening of cell walls. With the alkalis there was an increase in nuclear division, changes in chromosomes, and the cell outlines became obscured.

Both acid and alkaline phosphates at optimum concentrations caused increased growth in amphibia. In the case of the alkaline salts, higher concentrations resulted in death, preceded by a stage of hyper-excitability.

The effect on mammals showed that either alkaline or acid phosphates in the proportion of 0.26 to 0.38 gm. per kilogram of body weight caused an increased metabolism with diminishing body weight, and finally death.

The distribution of the indispensable inorganic nutrients in bean seedlings, II, L. von Portheim and M. Samec (*Flora, 99 (1909), No. 3, pp. 260–276*).—In a previous publication (E. S. R., 19, p. 426), the distribution of the more essential inorganic substances in bean seedlings when grown in Knop's solution with and without lime was shown. In the present paper an account is given of the distribution of these same compounds in bean seedlings with reference to the calcium and magnesium ratios. Analyses are reported showing the dry weight; ash; percentage of lime, magnesia, potash, phosphoric acid, sulphuric acid, chlorin, and iron oxid in the ash; and the weight of lime, magnesia, potash, and phosphoric acid in the ash of 250 of the seedlings. The data are grouped to show the amount of these different compounds in seedlings grown in distilled water and in normal solutions of the nitrates of lime and magnesia and various mixtures of these compounds.

The plants became diseased when grown in distilled water and in the solutions containing magnesium nitrate, the roots being stunted, browned, and often rotten. A mixture of the two compounds in the nutrient solution resulted in an increase in the amount of magnesia taken up and a reduction in the proportion

of lime. The slight increase in the magnesia content in the plants grown in the solutions containing lime and magnesia is believed to be due to the protective or neutralizing action of the lime.

The phosphorus nutrition of plants, Cavalier and Artus (*Trav. Sci. Univ. Rennes, 6 (1907), No. 1, pp. 132–139*).—A study was made of the availability of different sources of phosphorus for the nutrition of maize grown in sand and watered with nutrient solutions that varied only in the phosphorus compound employed.

In the cultures, which were maintained for 92 days, the same amount of phosphorus was added to each, the calculated quantity being 2.14 gm. The various sources of phosphorus were sodium orthophosphate, pyrophosphate, metaphosphate, and phosphite as inorganic compounds, and potassium monoethylphosphate, sodium diethylphosphate, triethylphosphate, and monoallylphosphate, and calcium glycerophosphate as organic compounds. The latter is said to be a commercial preparation, while for the others the author made and purified his own compounds. At the end of the experiment, the total weight, ash, phosphorus content, etc., for the different plants were determined.

All the treated plants were better developed than the checks, except in the lot where the glycerophosphate was used. This substance, or impurities which it contained, proved injurious to all the plants, greatly reducing their development. There was little or no difference in the proportion of phosphorus in the dry matter of the different lots of plants, but where an actual increase in phosphorus was noted, it was accompanied by an increased growth of the plants, hence by greater dry weight.

The experiments show that plants are not necessarily restricted to the orthophosphoric acid salts for their phosphorus supplies, but that maize is capable of taking phosphorus from a number of other organic and inorganic compounds.

Phosphorus and the formation of amino acids by the higher plants, F. Scurti (*Gaz. Chim. Ital., 38 (1908), II, No. 2, pp. 272–275*).—According to the author, a correlation exists between the presence of phosphorus and the formation of proteids in the higher plants. This correlation is not limited to the proteid nitrogenous bodies, but also pertains to the amino acid group of compounds, and probably plays an important rôle in the synthesis of all albuminoid substances in plants.

The decomposition of sugar during the processes of respiration, P. B. Jensen (*Ber. Deut. Bot. Gesell., 26a (1908), No. 9, pp. 666, 667*).—The author states that the decomposition of sugar during alcoholic fermentation is not a single process but involves two stages. The intermediary product is said to be dioxyacetone. In the process of decomposition the dextrose is broken down into dioxyacetone, which may further change into carbon dioxid and alcohol, or, by the addition of oxygen through the action of oxydase, into carbon dioxid and water.

On the "strength" and development of the grain of wheat, W. E. Brenchley (*Ann. Bot. [London], 23 (1909), No. 89, pp. 117–139, pls. 2, figs. 5*).—This investigation was inaugurated with a view to determining the question of the "strength" of wheat from a biological standpoint. The term "strength," according to the author, is by no means exactly defined, but for the purpose of his investigation it is taken to indicate the capacity of wheat to produce a large, well-piled loaf of bread.

In the author's summary it is stated that no cytological differences can be observed between wheat grains of different varieties, grown under similar conditions, which produce flour of varying strengths, nor are there any differences indicative of strength to be found in the developing grains of one variety of wheat grown in the same field, under similar soil and climatic conditions, but

subject to radical differences in manuring. The reputed difference in strength between grains of the same variety grown under identical conditions, but cut green and dead ripe, is not associated with any significant cytological change.

Examination of the different grades of flour obtained during the various processes of roller milling shows that the cells of the aleurone layer very rarely get into the flour, but remain attached to the bran. The endosperm of the seed during its development arises in the first place by free cell formation, but after about a week wall formation begins, starting from the periphery of the embryo sac and proceeding inward. The peripheral layer is marked off about two weeks after pollination, and develops into the aleurone layer. The deposition of starch grains begins in the middle of the flanks of the endosperm at the lower end of the grain and proceeds upward and outward. Reserve nitrogenous materials enter at the same time as the starch. During the process of ripening a disorganization of the endosperm nuclei takes place, caused by the increasing pressure of the surrounding food stuffs. The nuclei lose their nucleoli, become deformed, and finally appear as a fine network spread out between the intruding starch grains.

A study of the development of the embryo was made, and it was found to be normal, but a fifth lateral rootlet is said to be formed in addition to the two pairs of laterals usually described.

The presence of amylase in old seeds, Brocq-Rousseu and E. Gain (*Compt. Rend. Acad. Sci. [Paris], 148 (1909), No. 6, pp. 359–361*).—In previous accounts (E. S. R., 20, p. 130), the authors have shown that the duration of diastases in seeds is limited. In the present report the results are given of a study of wheat taken from museum specimens that are known to be 50 years old.

In this investigation dextrinase and amylase were found present and still capable of transforming starch into sugar. The experiments did not permit of definite conclusions as to whether the diastatic action was retained with its initial power for the entire period. They confirmed the conclusion, however, that the power of germination in seeds is not entirely due to the action of certain diatases, as the seeds in no case would germinate although the diastase was present.

The presence of oxydases in india rubber, D. Spence (*Bio-Chem. Jour., 3 (1908), Nos. 4, pp. 165–181; 6–8, pp. 351, 352*).—A study has been made of the latex of Para rubber trees and also of fresh latex from *Funtumia elastica*, from which the author is able to show the presence of oxydases in the latex. He believes that the darkening in color of raw rubber is due to an oxydase which is associated with the protein or the so-called insoluble constituent of the rubber. Further experiments are to be carried on to determine how far the oxydase is responsible for certain other changes occurring in raw rubber, such as decomposition, oxidation, and the like.

The second paper reports an examination of 4 separate samples of latex from *Hevea brasiliensis*, Para rubber, in each of which was found evidence of the presence of an oxidizing enzym, the chemical properties of which have not yet been studied.

The author suggests that the caoutchouc is probably a reserve food material for the plant, and that to account for its formation and subsequent decomposition the presence of oxidizing enzyms must be considered.

Relation of plant growth and vegetation forms to climatic conditions, J. J. Thornber (*Plant World, 12 (1909), No. 1, pp. 1–7*).—An account is given of studies on the relation of plant growth to climatic conditions in different parts of Arizona, particular attention being given to winter and summer annuals. The author claims that on account of temperature conditions, it is impossi-

ble to grow successfully during the winter months the annual summer flowering plants which do not survive the intense heat of the summer, or to grow during the summer months the annual flowering plants generally referred to as winter-growing species. This also holds true for vegetables.

Plant culture in diffused daylight, A. BURGERSTEIN (*Verhandl. K. K. Zool. Bot. Gesell. Wien, 58 (1908), No. 6–7, pp. 322–329*).—Experiments are reported on the growth of about 20 species of ornamental plants in diffused light and in beds so situated as to receive direct sunlight for a few hours in the morning and evening and diffused light during midday.

Almost without exception the growth of the stalks, leaves, flowers, and seed capsules was greatest in what is termed the mixed light. The plants remained green for a longer period, and flowered more abundantly. The dry weight of the plants which received the early and late sunlight was from 1.4 to 11.2 times as great as that of similar species grown in diffused light. Similar conditions were noted for flower and seed production.

The influence of light on the development of fruits and seeds, W. LUBIMENKO (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 24, pp. 1326–1328*).—Studies by the author have shown that while a certain amount of illumination is absolutely essential during the early stages for the formation of fruit, after a fruit has passed a short stage of development it is possible to complete its development in greatly reduced light. If self-pollinated plants are inclosed before the pollination of their flowers in black or white bags fastened to the plants, in general but very few normal fruits will be formed, due to the insufficient illumination. In one instance 30 heads of wheat were inclosed in black sacks before the pollination of the flowers and only 3 to 5 grains were produced to the head, while heads in the same stage of growth inclosed in white bags gave from 16 to 25 grains per head. Similar results were obtained with peas.

Studies made with a considerable number of plants show that there is an optimum for the illumination required for the development of dry matter in fruits and that this optimum corresponds to a somewhat attenuated illumination. The maximum dry weight of seeds and pericarp of a number of fruits, such as currants, cherries, apples, pears, etc., corresponds to illumination slightly less than the maximum of light. It is shown also that the acidity of the fruit diminishes with the illumination. In the majority of cases fruit inclosed in sacks was less acid than that maturing in the open. On the contrary, the material reduced by Fehling's solution was greater in those fruits which were inclosed in sacks and less in those ripening normally.

The influence of radium rays on a few life processes of plants, C. S. GAGER (*Pop. Sci. Mo., 74 (1909), No. 3, pp. 222–232, figs. 13*).—This paper is a nontechnical account of some of the more striking results described in the author's memoir on the effects of the rays of radium on plants (E. S. R., 20, p. 929).

The author summarizes his investigations, stating that radium acts as a stimulus to the various physiological processes of plants. If the strength of the radium, the duration of exposure, and other conditions are suitable, the response is an excitation of function, but if the radium is too strong and the exposure too prolonged, the result is a retardation, or a complete inhibition of function, or even the death of the plant. There were found to be differences in sensitiveness between individuals, and also between different species and different tissues.

Electroculture, J. B. MARTIN (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 29 (1908), No. 41, pp. 439–442*).—An account is given of some experiments carried on by Lieutenant Basty for the past 7 years in the vicinity of Tours,

France, to determine the effect of electricity applied before germination and during the various stages of development of plants on the earliness, abundance, and quality of fruit. The plants experimented with were potatoes, sainfoin, white mustard, spinach, beets, hemp, flax, barley, and wheat.

The experiments show that there is an evident stimulating action of atmospheric, dynamic, and static electricity on the growth of plants, practically all of the plants being more vigorous, blooming earlier, and giving a larger yield of leaf, stem, tuber, or other part compared.

Comparisons of the beginning of development of perennial and annual plants, G. ANDRÉ (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 26, pp. 1485–1487*).—A study was made of the walnut and horse-chestnut in the first year or two of growth and comparisons made with the dry material in annual plants.

In the annual plant the dry material in the young root is relatively high, representing about one-tenth of the total weight of the plant. This weight diminishes toward the end of the period of growth, when it does not represent more than 3 to 5 per cent of the total dry weight of the plant. In the case of the perennial plants the weight of the root is relatively low and is much less than with similar annual plants.

A study of the distribution of the mineral matter at different periods of growth showed that in annual plants it amounted to about one-seventh of the weight of the plant at the beginning of vegetative growth, and by the time of flowering to about one-fifteenth. With the walnuts and horse-chestnuts the proportionate weights were from about one-fiftieth to one-thirtieth.

Studies were also made of the distribution of phosphoric acid in the roots. The content was found to be relatively high at all periods of growth, but the proportionate amount was somewhat less in the walnut than in the horse-chestnut. The phosphoric acid continues to be taken up from the soil through the roots and supplied to the stem up to the end of active growth, when part of it is returned from the leaves before their fall. This translocation occurs in annual plants at the end of their period of growth.

Perennial plants during the first and second years of their growth behave very similarly to annual plants up to the time of their flowering. The absolute weight, however, of the roots of perennial plants is considerably greater than that of the annuals, and the reserve mineral materials are greater, particularly in the roots, where phosphoric acid among the mineral elements is stored for use in later stages of growth.

The perennation of the clover dodder (Cuscuta epithymum), F. C. STEWART and G. T. FRENCH (*Torreya, 9 (1909), No. 2, pp. 29, 30*).—Most botanical writers are stated to have considered the species of Cuscuta as annuals, although as long ago as 1868 Kühn claimed that clover dodder lived over winter on clover and alfalfa plants in Germany. This statement has been questioned by a number of investigators and confirmed by others, but apparently until quite recently there was no published record of any dodder living over winter in the United States.

The authors' investigations during the past 3 years have indicated that clover dodder lives over winter in New York alfalfa fields, hibernating on the crowns of alfalfa, red clover, and certain weeds, among them the fleabane (*Erigeron annuus*) and yellow trefoil (*Medicago lupulina*). It has also been found passing the winter on dandelion. The fleabane and the yellow trefoil are generally classed as annuals, but they are regularly biennial in New York.

Experiments have shown that it is quite possible, by placing the dodder-infested crowns of plants in a moist chamber for a few days, to secure an abundant growth, indicating that the plant passes the winter in a viable state. It appears probable that this is the principal method by which it is propagated.

On the parasitism of Siphonostegia, S. KUSANO (*Bul. Col. Agr. Tokyo Imp. Univ., 8 (1908), No. 1, pp. 51–57, figs. 5*).—The author has been carrying on studies on Japanese phanerogamic parasites, and in this paper gives an account of *S. chinensis*, which appears to be a hemiparasite. It is a herbaceous plant common in grassy fields of Japan. A detailed account is given of its anatomical structure.

Studies on Æginetia indica, S. KUSANO (*Bul. Col. Agr. Tokyo Imp. Univ., 8 (1908), No. 1, pp. 59–78, pl. 1*).—This paper gives an account of some of the facts in the life history of *Æ. indica*, a phanerogamic parasite common in Japan, where it occurs on certain species of monocotyledonous plants. Experiments have shown that the seed of the parasite will not germinate unless it has the stimulus of the roots of other plants. The stimulation may be induced by the presence of the roots of a great many plants, but its parasitism is limited to certain species of Cyperaceæ, grasses, ginger, cannas, etc.

FIELD CROPS.

Report on the agricultural and botanical departments, Barbados, D. MORRIS (*Imp. Dept. Agr. West Indies, Rpt. Agr. and Bot. Depts. Barbados, 1898–1907, pp. 37, figs. 14, dgms. 2*).—This report covers the period 1898–1907, and includes a review of the sugar-cane experiments since 1884. The work with cotton, bananas, and other crops is also noted.

Since 1898, when the Imperial Department of Agriculture was established, about 30,000 canes have been raised from seed. In 1904 work was begun which resulted in securing 5 hybrid sugar canes through artificial cross-pollination. The raising of seedling canes resistant to disease and yielding a large amount of sugar is also one of the principal lines of work. The history of these experiments is given in full and the results secured each season are briefly summarized. During recent years a number of canes are being tested which seem to give even better results than B. 147 and B. 208, which have given very satisfactory yields. Among these canes are B. 1753, B. 3390, B. 3412, B. 3675, B. 3696, B. 3747, B. 6204, and B. 6450.

The results of fertilizer experiments with sugar cane are summarized for the past 13 years. In the nitrogen series the most satisfactory yields were obtained where 60 lbs. of nitrogen as sulphate of ammonia was applied in June, in addition to 80 lbs. of assimilable phosphates, and 60 lbs. of potash as sulphate of potash, the average yield being 7,911 lbs. of saccharose per acre.

In the superphosphate series of experiments the best results were secured on the plat which received only nitrogen and potash. In the basic slag series of plats the best result for 12 years was obtained on the plat which received 100 lbs. of phosphate as basic slag, the yield being 8,446 lbs. of saccharose per acre as compared with 8,406 lbs. on the check plat.

The best result in the potash series was obtained on the plat which received 80 lbs. of potash as sulphate of potash, in addition to 15 lbs. of nitrogen as sulphate of ammonia in January and 45 lbs. in June, and 80 lbs. of phosphate as superphosphate of lime applied in January. The average yield in this series was 7,739 lbs. of saccharose per acre.

Tillage experiments showed a difference of 2½ tons of canes per acre between the best and the poorest plat. The most favorable results were secured from close subsoiling, digging the cane holes, manuring, and cultivating in the usual manner, and the least favorable results were secured on the plats ridged with a disk plow, turning under farmyard manure 8 in. deep, planting the canes in rows at the bottom of the furrows, and cultivating.

The cotton industry in Barbados is described and the results of fertilizer experiments are reported. In determining the quantity of nitrogen needed to produce the best results it was found that the most satisfactory yields were secured when nitrogen as sulphate of ammonia was applied at the rate of 30 lbs. per acre, the increased yield amounting to 279 lbs. of seed cotton. In the phosphoric acid series 40 lbs. of phosphoric acid as superphosphate of lime produced the best effects, the increase in seed cotton being 281 lbs. per acre. The most satisfactory returns in the potash series were secured where 20 lbs. of potash as sulphate of potash was used. In these tests the increase of seed cotton per acre amounted to 196 lbs.

Nitrogen fertilizer experiments on meadows, Bachmann (*Landw. Wchnbl. Schles. Holst., 59 (1909), No. 2, pp. 22–24*).—Cooperative tests are reported in which sulphate of ammonia, nitrate of soda, and nitrogen lime were compared. In one experiment the plats were 0.05 hectare (about $\frac{1}{8}$ acre) in size and each received 25 kg. each of Thomas slag and kainit. The nitrogen was applied in 10 kg. of sulphate of ammonia and 10 kg. of nitrogen lime, each substance containing 20 per cent of nitrogen.

In 1907 the average yield of hay from one cutting on the plat receiving no fertilizer whatever was 62.5 kg., and on the plat treated only with Thomas slag and kainit 86.5 kg. The plat receiving one-fourth of the sulphate of ammonia in the spring and three-fourths in the fall gave 110.5 kg. of hay, the plat receiving the entire application of sulphate in April 133.5 kg., the one receiving the sulphate in two applications in spring 176 kg., and the plat treated with the nitrogen lime in one application early in April 165 kg. In 1908 the yields of hay on these plats without further fertilization were 125.5, 161, 183.5, 189, 203, and 207.5 kg. respectively.

The results of a second and a third experiment show that nitrate of soda given in two applications in the spring gave the best yields of hay, being followed by sulphate of ammonia and nitrogen lime, each given in a single application in the spring.

Manurial experiments on grass land, 1908, J. Percival (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 4, pp. 27*).—The cooperative fertilizer experiments on grass land were conducted at 13 centers. Nitrogen, phosphoric acid, and potash were applied in different combinations, the applications consisting of 1 cwt. of nitrate of soda, 5 cwt. of basic slag, and 3 cwt. of kainit per acre, with the exception that in the complete application only 2 cwt. of kainit was used. Barnyard manure was applied at the rate of 16 loads per acre.

The increase in crop as due apparently to the different fertilizer treatments was as follows: Nitrate of soda alone, 5 cwt.; kainit alone, 5 cwt.; slag alone, 10 cwt.; the complete fertilizer application, 15.25 cwt.; barnyard manure, 13.75 cwt.; slag and kainit together, 10.25 cwt.; slag and nitrate of soda, 12.75 cwt.; and nitrate and kainit together, 11.25 cwt. The herbage grown with the commercial fertilizer was of a much better quality than that produced with barnyard manure.

It was observed that soils containing less than 0.025 to 0.030 per cent of available phosphoric acid generally responded freely to the use of a phosphatic fertilizer such as slag or superphosphate. Soils containing less than 0.010 per cent of available potash gave increased yields and improved quality of grass when kainit or sulphate of potash were used.

Rotation experiment, R. B. Greig (*Aberdeen and No. of Scot. Col. Agr. Bul. 10, pp. 11–16*).—The rotation consisted of turnips, barley, and hay, and the standard application of fertilizers per acre comprised 20 lbs. of nitrogen, 100 lbs. of phosphoric acid, and 40 lbs. of potash. The results showed that super-

phosphate gave a profit of 20s. per acre, basic slag 17s. 3d., and ground Florida phosphate 5s. 9d., and the use of bone meal a loss of 27s. 3d. per acre. When these fertilizers were applied with barnyard manure they all gave a profit, the largest £4 2s. 7d. per acre over the unmanured plat being secured from ground Florida phosphate.

The utilization of straw, A. Grégoire (*Rev. Écon. Internat., 6 (1909), I, No. 2, pp. 438–448*).—The value of straw for litter, manure, and feeding is pointed out, and a résumé of experiments on the effect of straw in barnyard manure and on the preparation of straw for feeding purposes is presented.

Southern crops, edited by G. F. Hunnicutt (*Atlanta, Ga., 1908, pp. 245, figs. 10*).—This book treats of the culture of cotton, cereals, hay, forage and root crops, and also of several of the most common vegetables.

Cotton production in Egypt, F. C. Roux (*Rev. Écon. Internat., 6 (1909) I, No. 2, pp. 303–339*).—This article discusses the history of cotton culture in Egypt, the progress in its cultivation, and the systems of irrigation and drainage in use, and presents statistics on the production and commerce.

International Cotton Congress, Paris, 1908 (*Off. Rpt. Internat. Cotton Cong., 5 (1908), pp. 341*).—This is the official report of the Fifth International Cotton Congress held in Paris, June 1–3, 1908. The proceedings have a bearing on the various phases of the cotton industry, including statistics with reference to production and commerce, and papers on cotton growing in the United States, the Congo Free State, the French and German colonies, Asia Minor, and the Eritrean colony of Italy. Copies of the statistics issued by the International Federation of Master Cotton Spinners' and Manufacturers' Associations in regard to the consumption of cotton and stocks of cotton in spinners' hands are given in an appendix.

Potato variety tests by the German experiment station for potato culture, C. von Eckenbrecher (*Ztschr. Spiritusindus., 1909, Sup., pp. 3–56; abs. in Deut. Landw. Presse, 36 (1909), Nos. 15, pp. 159, 160; 16, p. 174*).—Cooperative tests were conducted in 1908 in 27 different localities of Germany with 20 varieties of potatoes, and the results secured in each individual test are reported in tabular form and described.

According to starch content the leading varieties were Agraria, Erste von Nassenheide, and Prof. Wohltmann, with 21.5, 21.3, and 21 per cent of starch, respectively. The leading varieties in productiveness and their yields were as follows: Hassia, 27,640 kg.; Alma, 25,010 kg.; and Fürstenkrone, 24,910 kg. per hectare. Arranged according to starch production, Prof. Wohltmann stood first with a yield of 5,180 kg., Böhms Erfolg second with 5,060 kg., and Switez third with 4,920 kg. per hectare.

Notes on the composition, disease resistance, keeping quality, and value for different uses of the varieties are given, and all results are tabulated in detail. Bojar, Switez, Brocken, Bohun, Böhms Erfolg, Erste von Nassenheide, and Prof. Wohltmann showed the highest keeping quality, and Alma, Bojar, Böhms Erfolg, Richter Imperator, and Brocken are considered the best varieties for eating purposes.

Potato variety tests conducted by F. Heine at Hadmersleben, 1908, W. Oetken (*Ztschr. Spiritusindus., 1909, Sup., pp. 57–66*).—In 1908, 129 varieties of potatoes were grown and yielded on an average 28,640 kg. of tubers per hectare (about 25,500 lbs. per acre), containing 17.90 per cent of starch and producing an absolute average yield per hectare of 5,126 kg. (4,562 lbs. per acre).

The beet-sugar industry, A. Blue (*Census and Statis. [Canada] Bul. 9, pp. 75, figs. 3*).—This bulletin describes the present development of the beet-sugar

industry in Canada, outlines its possibilities, and presents statistics with reference to sugar production, consumption, and commerce.

Tobacco, J. G. SMITH (*Honolulu Chamber Com. Ann., 1908, pp. 123, 124*).—The possibilities of tobacco culture in Hawaii are briefly discussed. It is stated that in 1908 about 65 acres were grown. It is estimated that the planting for 1909 will be from 300 to 500 acres and that the output for the next 3 years will be about 5,000 bales.

Notes on tobacco, J. VAN LEENHOFF (*Transvaal Dept. Agr., Farmers' Bul. 2, pp. 9, figs. 7*).—General notes on tobacco soils and seed-bed management are presented.

How to produce bright tobaccos, J. VAN LEENHOFF (*Transvaal Dept. Agr., Farmers' Bul. 10, pp. 16, figs. 4, dgm. 1*).—General directions for growing this type of tobacco and for curing it are given.

Report on turnip experiment, 1907, R. B. GREIG (*Aberdeen and No. of Scot. Col. Agr. Bul. 10, pp. 1–10*).—Nitrate of lime and calcium cyanamid were practically as effective as sulphate of ammonia. The cyanamid was applied with the seed and appeared to have no detrimental effect. Not taking the residual value into account, 5 cwt. of superphosphate was applied at a loss as compared with 2½ cwt. The results with high-grade and low-grade slag showed but little difference.

On the inheritance of strength in wheat, R. H. BIFFEN (*Jour. Agr. Sci., 3 (1908), No. 1, pp. 86–101, dgm. 1*).—The statement is made in this article that Red Fife after having been grown in England for 6 years is still equal in strength to the same variety grown in Canada. Culture tests have shown that in some localities this variety produces better crops than the common English sorts, while in others its yields are not profitable. It has also been brought out that the straw is not as strong as desirable. These facts have led to attempts to originate varieties having the productivity of common English wheats combined with the strength of the Red Fife.

Varieties with soft starchy grains were crossed with the Red Fife, which produces hard and translucent kernels. Among soft varieties, Rough Chaff and Rivet when grown on poor soil have rarely produced translucent grains, while in Squarehead Master, Browick, Standup, and others opaque and translucent grains have often been found in one and the same head when the varieties were grown on poor soil. In the experiments referred to, Red Fife was used more than any other variety as a strong parent, but a considerable number of varieties of Russian and Canadian wheats were also included.

The F. 1 generation of plants raised from the hybrid grains produced a grain of undoubted strength, but no indications of segregation into strong and weak grains could be detected at this stage. The F. 2 generation was grown under uniform soil conditions and each plant harvested separately. The grain types were sorted out, and in the cases examined the segregation into strong and weak types was perfectly obvious. On attempting, however, to count out the types represented in the F. 2 generation it was found that some crosses gave simple Mendelian ratios, while others could not be sorted with any accuracy. In one cross between Rough Chaff and Fife wheat 4 types of grain were present, strong red, strong white, weak red, and weak white. In the first 100 samples the proportions of these were 58 : 16 : : 18 : 8, and in the second, 59 : 18 : : 16 : 7, showing a reasonably near approach to the 9 : 3 : : 3 : 1 ratio expected when the characters redness and whiteness and strength and weakness are concerned. On the other hand, the F. 2 generation of a cross between Red Lammas and Red Fife contained plants with obviously strong and weak grains, but between the extremes there was a long series of plants which could not be classified with any certainty.

From 30 to 40 plants were raised from individuals of the F. 2 generation, these being selected for the most part for recessive chaff and color characters. The grain characters of parent and progeny were as follows: The F. 2 generation plants of Rough Chaff crossed with Fife, which were used in the test, represented 50 strong and 12 weak plants, and the types of the F. 3 generation showed 16 strong, 34 mixed, and 12 weak plants. In the case of the hybrid between Lammas and Red Fife the F. 2 generation plants sown represented 50 strong, 20 mixed, and 10 weak individuals, while the types of the F. 3 plants showed 50 strong, 3 strong and 17 mixed as corresponding to the 20 mixed in the F. 2 plants, and 10 weak individuals. It is pointed out that in the first case strength is dominant to lack of strength and that the heterozygotes are indistinguishable from the dominant homozygotes, but that in the second case the domination is not so sharply marked and the heterozygous individuals can be distinguished with a certain degree of accuracy. These examples were typical of some 30 others, but in most of them it was not considered necessary to determine whether the recessive lack of strength was pure from the moment of its appearance in the F. 2 generation. Forty of 66 strong cultures proved homozygous in all respects. The grain of the F. 3 generation was planted and the result demonstrated the value of Mendelian methods, for in this F. 4 generation the types appeared perfectly fixed.

The milling of these grains showed that they were strong wheats, and this character was so prominent that the miller without knowing the origin of the grain he was grinding noted that it ground like Manitoban wheat. Later, baking tests also confirmed the conclusion that strength and lack of strength segregate from one another in the F. 2 generation in the same manner as the morphological characters already examined.

In another experiment of this kind, a cross between Polish wheat (*Triticum polonicum*) and Rivet wheat (*T. turgidum*) was studied. The grain of the Polish wheat is brittle, translucent, and white in color, and has an average nitrogen content of 2.2 per cent, while the Rivet wheat is a typical starchy red wheat with a soft, mellow endosperm and an average nitrogen content of about 1.6 per cent. In the F. 1 generation the grain was uniformly brittle, translucent, and red. In the following generation the expected segregation into red and white, translucent and starchy grains occurred, but the mode was not as simple as in certain of the crosses referred to above. When the endosperm characters were taken into consideration it was found that many plants produced grain which could not satisfactorily be placed in either the starchy or the translucent class. The results of a further examination showed that the distribution of the nitrogen content is not affected by the shape of the glumes. It is stated that the failure to give sharp segregation into two or more groups in the F. 2 generation is not uncommon in crosses between cereals. In the F. 3 generation it was shown that all plants selected on the basis of short or long glume character bred true to these characters, and that when they were chosen from the intermediate series they proved heterozygous. The author points out that an analysis of the F. 3 generation is required to unravel the mode of segregation, when it will be found that the heterozygotes can be at once distinguished from the homozygotes and that they occur in the ordinary Mendelian proportions.

The analysis of the F. 2 generation showed that the grains with a translucent endosperm were high, and those with a mellow, starchy endosperm low in nitrogen. Grains flecked with starchy patches generally showed an intermediate nitrogen content, but the percentages varied widely. A slightly flecked sample, for instance, did not always show a higher content than one in which the grains were starchy. The plants producing translucent grain were considered to be

homozygous with regard to high nitrogen content and those with mellow grain were considered to be pure with respect to low nitrogen content. Analyses made of such bulk samples gave an average content of 2.4 and 1.6 per cent of nitrogen, respectively. The remaining samples were mixtures of translucent, starchy, and flecked grains, the last type being the most abundant. The occurrence in one F. 3 bunch of grain resembling each of the parental forms is taken as showing that the F. 2 plant from which it was descended was heterozygous in its endosperm characters. The total nitrogen contents of the majority of such F. 2 plants fell within the limits of 1.7 to 2.1 per cent. Thus, the nitrogen content from 1.3 to 1.6 or from 2.3 to 2.6 marked approximately the pure low or pure high types distinguishable from the heterozygotes by analyses only. The total number of plants with low nitrogen content was 26, 63 were apparently heterozygotes, and 21 were high in nitrogen.

The baking properties of a number of hybrid wheats, as determined by other investigators, are discussed, and the results taken in all are believed to indicate that the problem of breeding strong wheats suitable for English conditions offers no special difficulties. It is also believed that high yielding capacity and strength can be obtained in combination in the same variety, although it still remains to be determined whether high and low yielding capacity segregates at the F. 2 stage.

HORTICULTURE.

The scientific aspects of Luther Burbank's work, D. S. Jordan and V. L. Kellogg (*San Francisco, 1909, pp. XIV+115, pls. 14, figs. 20*).—This work comprises a paper entitled Some Experiments of Luther Burbank (E. S. R., 16, p. 773), by D. S. Jordan, and one entitled Scientific Aspects of Luther Burbank's Work, by V. L. Kellogg. These papers were originally published in *Popular Science Monthly*, and are here reprinted in book form with the view of acquainting general readers with the scientific character and value of Burbank's work.

Vegetable growing in Cuba, C. F. Austin and E. W. Halstead (*Estac. Cent. Agron. Cuba Bul. 13, pp. 44, pls. 6*).—This bulletin reports the practical results secured by the station during the past 3 years in growing and marketing various kinds of garden vegetables. Brief descriptions are given of the different varieties grown, including statements relative to their adaptability to the soil and climatic conditions of Cuba.

The home garden, E. E. Rexford (*Philadelphia and London, 1909, pp. 198, pls. 8*).—This is a popular work on vegetable and small-fruit growing for the use of the amateur gardener.

Report of the government horticultural experimental fields in South Holland for 1908, C. H. Claassen et al. (*Verslag Rijkstuinbouwproefvelden Zuid-Holland, 1908, pp. 120*).—Data are given for 161 cooperative cultural, variety, fertilizer, and spraying experiments with fruits and vegetables conducted at various localities in South Holland in 1908, under the direction of the professor of horticulture at Boskoop. Several experiments are also reported in which fruit grown in paper sacks was compared with fruit grown without such protection.

Contribution to the physiology of the graft. Influence of the stock on the scion, G. Rivière and G. Bailhache (*Jour. Soc. Nat. Hort. France, 4. ser., 10 (1909), Feb., pp. 133–135*).—Analytical data secured in 1908 are given of the must of grapes of *Chasselas musqué* grown upon its own roots and upon 10 different stocks, which appear to show, as the authors previously found in investigations with apples and pears (E. S. R., 19, p. 539), that the stock has a

decided influence in either enhancing or detracting from certain characteristics of the scion, which in this instance is indicated by variations in the sugar and acid content of the must.

New experiments in fertilizing grapes, J. Stoklasa (*Wiener Landw. Ztg., 59 (1909), No. 18, p. 182, figs. 3*).—In fertilizer experiments with grapes conducted at the Agricultural Physiological Experiment Station, at Prague, Bohemia, the plat manured with a combination of superphosphate and kainit gave larger yields of fruit and a higher sugar content in the must than the unfertilized plat. A complete fertilizer, composed of superphosphate, kainit, and ammonium sulphate, gave still better results.

The history of viticulture with special reference to the Rhenish Palatinate, F. Bassermann-Jordan (*Geschichte des Weinbaus unter besonderer Berücksichtigung der Bayerischen Rheinpfalz. Frankfort-on-the-Main, 1907, vols. 1, pp. 350, pls. 10, figs. 66; 2, pp. 351–690, pls. 7, figs. 45; 3, pp. 691–962, pls. 4, figs. 27*).—This extensive work may well be considered an encyclopedia of German viticulture.

Part 1 contains a general historical account of grape growing in Germany from the earliest period to the present time. Part 2 consists of a detailed historical study of grape growing and wine making. Part 3 discusses the various obstacles which have confronted German viticulture, of which the chief is shown to have been man by means of war, abuse of taxation, cultural restrictions, wine falsification, etc. Part 4 treats of the history of wine utensils, and of different kinds of wine, and contains a considerable amount of data relative to the cost of production, wages, yields, and returns in different periods. In part 5 the author has brought together and arranged in chronological order a vast number of more or less brief notes gleaned from documents of various kinds on wine growing, meteorological data, and wine prices covering a period of several centuries. Part 6 deals with the statistics of the wine trade and wine consumption. Part 7 concludes the work with an extensive bibliography of viticultural literature.

Date varieties for the Southwest, J. E. Coit (*Pacific Rural Press, 77 (1909), No. 11, pp. 201, 210, figs. 2*).—Descriptions are given of 3 Arizona-grown seedling dates which appear to be sufficiently valuable to warrant further propagation.

Scheme for the classification of the races of olives grown in southern Italy, M. Marinucci (*Schema di Sistemazione delle Razze d'Olivo Coltivate nell' Italia Meridionale. Naples, 1908, pp. 18*).—The author presents a system for classifying olives according to the shape of the fruit in which they are grouped under 5 main types: Fusiform, circular oblong, elliptical oblong, elliptical, and obovate. They are again subdivided into regular obtuse and acute, and irregular obtuse and acute. In the final subdivision they are classified as pure-bred and mongrel.

The coffee tree, E. P. Dieseldorff (*Der Kaffeebaum. Berlin, [1909], pp. 36, fig. 1*).—This pamphlet contains practical notes on coffee culture in northern Guatemala.

The mangoes of Bhagalpur, E. J. Woodhouse (*Dept. Agr. Bengal, Quart. Jour., 2 (1909), No. 3, pp. 168–187*).—Horticultural descriptions are given of a large number of varieties of mangoes, including those commonly found in the market at Bhagalpur as well as several received from the Sabour Experimental Farm. The characteristic shapes of the different varieties described are indicated by outline drawings.

The book of the pansy, viola, and violet, H. H. Crane (*New York and London, 1907, pp. VIII+106, pls. 15, figs. 1*).—This popular work treats in

detail of the methods of growing various kinds of pansies and violets, both for general purposes and for exhibition.

Classified list of daffodil names, 1908 (*London: Roy. Hort. Soc., 1908, pp. 51*).—This consists of an alphabetical list of all known daffodils, prepared by the Royal Horticultural Society of London. The different varieties are placed in one of 7 arbitrary divisions, based principally on measurements, as follows: Long trumpets, short trumpets, large cups, small cups, flat cups, doubles, and bunch-flowered. This system of classification is commended for trial for garden and show purposes.

The encyclopedia of gardening, T. W. SANDERS (*London [1909], 13. ed., pp. XV+466*).—This work consists of a dictionary of plants generally cultivated in gardens. It gives in alphabetical sequence the culture and propagation of hardy and half-hardy plants, trees and shrubs, orchids, ferns, fruits, vegetables, hothouse and greenhouse plants, etc., including the specific and common names. The present edition has been revised and brought up to date relative to cultural methods, varieties, nomenclature, etc.

Garden design—comparative, historical, and ethical, T. H. MAWSON (*Jour. Roy. Hort. Soc. [London], 34 (1909), No. 3, pp. 361–372, 378–383, figs. 6*).—This consists of two lectures on the above subject delivered before the Royal Horticultural Society in September, 1908.

The practice of garden design, T. H. MAWSON (*Jour. Roy. Hort. Soc. [London], 34 (1909), No. 3, pp. 384–393, figs. 2*).—The third lecture on the series noted above, in which the author offers several suggestions on the practical development of garden design.

The Royal Botanic Gardens, Kew, W. J. BEAN (*New York, Paris, London, Toronto, and Melbourne, 1908, pp. XX+222, pls. 60*).—This work contains a historical account of the Kew Botanic Gardens, together with a discussion of its aims, its work, and the leading principles on which it is conducted. Part 1 deals with the origin and development of the Royal gardens. Succeeding portions of the work discuss in detail English landscape gardening at Kew, Kew in its scientific aspects, plant collections (tropical and warm temperate), and the hardy plant collections. The work is well illustrated by reproductions in color and half-tone photographic plates.

A park system for the city of Cincinnati, G. E. KESSLER (*Cincinnati: Board of Public Service, 1907, pp. 54; pls. 15, figs. 6, maps 8*).—This consists of a comprehensive plan for parks and parkways in Cincinnati, prepared by the author at the instance of the Cincinnati Park Commission. Maps and illustrations are given showing the proposed park system as a whole and the treatment of various sections.

FORESTRY.

Trees, H. M. WARD (*Cambridge, 1908, vol. 4, pp. 161, pl. 1, figs. 147*).—This is the fourth volume of a series by the author, which was designed as a handbook of forest botany for the woodlands and the laboratory. Its publication was interrupted by the death of the author. The present volume treats of fruits, the previous ones treating of buds, leaves, flowers, and inflorescences (E. S. R., 17, p. 255).

The trees of Great Britain and Ireland, H. J. ELWES and A. HENRY (*Edinburgh, 1909, vol. 4, pp. VIII+713–1000, pls. 64*).—This is volume 4 of an extensive treatise which is being issued on the trees either native to or cultivated in Great Britain and Ireland (E. S. R., 20, p. 340). The volume, like the previous volumes, is divided into 2 parts.

In part 1 the varieties and species of the following genera are considered relative to their history, botany, distribution, cultural requirements, uses of the timber, etc.: Abies, Pseudotsuga, Castanea, Fraxinus, Zelkova, Celtis, Alnus, Betula, and Diospyros. Descriptions are also given of specimen trees growing in Great Britain. Part 2 is made up of illustrations and botanical drawings of the trees discussed in part 1.

Woods and forests in Jamaica, W. Fawcett (*West India Com. Circ., 23 (1908), Nos. 265, pp. 561–562; 266, p. 586; 267, pp. 609–610; 24 (1909), Nos. 268, p. 11; 269, pp. 36, 37; 270, pp. 58, 59; 271, p. 82; 272, p. 106*).—The author briefly discusses the important features involved in the management and exploitation of forests, and gives a reference list of some of the more important native timbers of Jamaica as well as such foreign timbers as might be grown to advantage. Each species of wood is briefly described relative to its distinguishing characteristics, economic value, and uses.

Micrography of the woods of Javanese trees, J. W. Moll and H. H. Janssonius (*Mikrographie des Holzes der auf Java vorkommenden Baumarten. Leyden, 1906, vol. 1, pt. 1, pp. 368, figs. 44; 1908, vol 1, pt. 2, pp. 369–568, figs. 30; vol. 2, pp. 160, figs. 21*).—The authors have conducted since 1903 an extensive investigation relative to the wood anatomy of Javanese species of trees. In the 2 volumes thus far published descriptions are given of the wood anatomy of some 230 species. Under each description is given the important literature of the species, notes on the material used in the study and its preparation, the reagents employed, and a detailed micrographical description of the wood and its component elements. Figures are given showing the sections of all dissimilar woods. Introductory chapters in volume 1 discuss the methods employed in the investigation, the preparation of the material, the nomenclature used, etc.

The pines of Mexico, G. R. Shaw (*Boston, 1909, pp. 29, pls. 22, map 1*).—This paper, which is the first of a series of publications of the Arnold Arboretum, consists of a systematic classification, botanical descriptions and drawings of the Mexican species of pines. The paper is based upon specimens collected by representatives of this Department and of the National Museum, and submitted to the author for identification, together with personal studies of these pines in their native country. Reference is given to the literature on the various species as well as to the different collectors and the specimen numbers in the National Museum. The author finds that numerous forms previously described as distinct species are but several varieties of a few species.

Monterey pine, F. Albert (*El Pino de Monterei, Pinus insignus o mejor Pinus radiata. Santiago de Chile: Min. Indus., 1908, pp. 26, figs. 19; An. Agron. [Santiago de Chile], 3 (1908), No. 2–3, pp. 376–399, figs. 19*).—A monograph on this species of pine with special reference to its culture in Chile. A list is given of its common names and synonyms, and the species is discussed relative to its botany, habitat, range, geographical distribution, the timber and its uses, climatic and soil requirements, methods of propagation, and silvicultural treatment.

Canary Islands pine, F. Albert (*El Pino Tea de las Canarias o Pinus Canariensis. Santiago de Chile: Min. Indus., 1908, pp. 36, figs. 14; An. Agron. [Santiago de Chile], 3 (1908), No. 2–3, pp. 333–366, figs. 14*).—A monograph on this species of pine similar to the one noted above.

Sand-binding plants, V. S. Iyer (*Indian Forester, 35 (1909), No. 2, pp. 82–97*).—The author gives a brief survey of attempts made in different countries and at different times to bind drifting sand, discusses climatic and other influences affecting plant growth in sandy regions, and describes several

peculiarities of root systems, stems, leaves, flowers, etc., of sand-binding and other maritime plants. A list is also given of typical sand-binding plants.

Timber, J. R. Baterden (*London, 1908, pp. 351, figs. 54*).—A practical work consisting of descriptive notes on the economic timbers of various countries, together with a discussion of subjects of importance to the timber industry, including the causes of decay and destruction, seasoning and impregnation, defects in timber, strength and testing, and "figure" in timber. The work is based upon the author's personal experience, supplemented by information secured from various authentic sources. A bibliography is appended.

Planting and care of a forest of evergreens, A. Knechtel (*Dept. Int. Canada, Forestry Branch Bul. 2, pp. 8, figs. 3*).—A brief, popular bulletin on this subject which discusses the collection of seed, nursery practices, planting operations, thinnings, and the final cut.

The new planting method in forests, M. Kozesnik (*Die neue Pflanzungs-Methode im Walde. Vienna, 1908, 3. ed., pp. 19, figs. 6*).—This is the revised edition of a short paper on this subject which was first published several years ago, and in which the author recommends and describes in detail a method of planting young trees which closely corresponds to the careful methods employed by private gardeners in setting out plants.

Forest valuation and forest statics, H. Stoetzer (*Waldwertrechnung und Forstliche Statik. Frankfort-on-the-Main, 1908, 4. ed., pp. VIII+248*).—This is a manual of forest valuation and statics. In the introduction consideration is given to the importance, historical development, and literature of these subjects. Part 1 contains a general discussion of worth and price and treats in detail of the fundamental principles, execution, and application of forest valuation. Part 2 discusses forest statics relative to methods of estimating and their application.

Is permanent forestry justified from a financial point of view? K. Fredenberg (*K. Landtbr. Akad. Handl. och Tidskr., 47 (1908), No. 5–6, pp. 289–311*).—The results obtained in the management of a number of Swedish crown forests are given with the view of supporting an affirmative answer to the above question.

Report of the Pennsylvania Department of Forestry for the year 1907 (*Rpt. Penn. Dept. Forestry, 1907, pp. 197, pls. 19*).—This report includes a statement of the general operations of the department of forestry and of specific forest administration by foresters and other officers of the department, together with several papers dealing with practical phases of forestry.

Report of the superintendent of forestry, R. H. Campbell (*Dept. Int. Canada, Ann. Rpt., 1908, pt. 7, pp. 46, pls. 12*).—In addition to a general report of forest operations of the forestry branch of the Canadian Department of the Interior for the year 1907–8, reports are given by the officials in charge of the different divisions of the work.

The Dominion forest reserves, A. Knechtel (*Dept. Int. Canada, Forestry Branch Bul. 3, pp. 19, pls. 4*).—This bulletin contains a general account of the Dominion forest reserves relative to their purpose and administration. The following phases are discussed: Location and area, dates of formation, grazing on forest reserves, protection against fire, reforesting, removal of squatters, marking reserve boundaries, forest survey, kinds of timber, timber estimates, removal of timber, and the reserves as pleasure resorts.

Report of the Rocky Mountains Park of Canada, H. Douglas and N. B. Sanson (*Dept. Int. Canada, Ann. Rpt., 1908, pt. 5, pp. 26, pls. 27*).—This report embraces the annual reports of the superintendent of the Rocky Mountains Park, Yoho Park, and Glacier Park reserves, and of the curator of the museum, for the fiscal year ended March 31, 1908. The meteorological data for the year,

and numerous plates illustrating plant life and various scenes in the parks are appended.

Report on the reforestation of waste lands in southern Ontario, 1908, E. J. Zavitz (*Toronto: Ontario Dept. Agr., 1909, pp. 28, figs. 21*).—In this report the author describes and gives maps of the various districts of southern Ontario, discusses the present condition of the waste lands, and presents figures to show the financial possibility of artificially reforesting these lands at a profit. The conclusion is reached that on large areas where no seed trees of commercial species exist, it will be impossible to obtain satisfactory new natural growth within a reasonable time, and the policy of putting these lands under forest management is advocated.

Report of the superintendent of forestry, R. S. Hosmer (*Rpt. Bd. Comrs. Agr. and Forestry, Hawaii, 5 (1908), pp. 11–55*).—This is the customary annual report of the division of forestry. It discusses the present status of the forest reserves, the progress made in forest extension, miscellaneous forest work, the present status of rubber in Hawaii, and results of rubber tapping tests, which have been noted from another source (E. S. R., 20, p. 844). Reports of the district foresters and the forest fire service are also included, together with a summary of recommendations for further development of the work.

Report of the forest nurseryman, D. Haughs (*Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 5 (1908), pp. 56–62*).—A progress report on the work at the government nursery, the forestry experiment station at Makiki, the Nuuanu Station, and the Tantalus Forest, including a statement as to advice and assistance rendered for the year ended December 31, 1908.

Annual report of the director of forestry of the Philippine Islands for the period July 1, 1907, to June 30, 1908, G. P. Ahern (*Ann. Rpt. Dir. Forestry P. I., 1908, pp. 26*).—A progress report on the work conducted during the year by the divisions of administration and investigation, including a discussion of new legislation and miscellaneous matters pertaining to the Philippine forest service. The appendix contains tabular data relative to licenses, registration of woodlands, utilization of forest products, timber cut by leading licensees, important timbers by species, imports and exports, revenues, and expenses.

Para rubber cultivation, C. Mathieu (*Culture du Caoutchouc de Para. Paris, 1909, pp. II+201, figs. 46*).—This work, which is offered as a manual of rubber cultivation in Malaysia, is printed both in English and in French. Part 1 deals with the problems which confront the prospective settler, such as the selection and acquirement of land, location and construction of dwelling houses and other buildings, methods of living, the labor question, etc. Part 2 discusses rubber culture in detail, including the preparation of the land, nursery practices, planting operations, manuring, pruning and subsequent care, collecting latex, and preparation of rubber for market. Estimates are given relative to yields, expenditures, and returns.

Distribution of [Guayule] rubber in different parts of the shrub, T. Whittelsey (*Jour. Indus. and Engin. Chem., 1 (1909), No. 4, pp. 247–249, dgms. 2*).—Analytical methods and data are given of an investigation relative to the distribution of Guayule rubber in different parts of the plant.

In a previous paper on this subject (E. S. R., 17, p. 257), Endlich reported that the ratio of the rubber found in the bark to that found in the wood is approximately 7 : 2. The data secured from the present investigation indicate that the trunk wood contains no rubber, although it does contain a small percentage of a rubber-like resin which might be mistaken for rubber when the extraction is made directly with tetrachlorid. Analyses of the whole plant

gave 9.5 per cent pure rubber on a water-free basis, or, taking the mill weight of the material as a basis, 8 per cent. Inspection of the material prepared for analysis showed that the trunks were made up of 46.4 per cent bark and 53.6 per cent wood. Determinations made of 2 whole plants gave 54.6 and 57.8 per cent of bark, respectively.

[Rubber tapping experiments and mechanical tests of several Surinam woods], W. A. VAN ASBECK (*Dept. Landb. Suriname Bul. 15, pp. 17*).—This bulletin contains the results of tapping experiments conducted with *Hevea guyanensis* in 1908, including analyses of samples of the rubber, and notes on their valuation by different commercial firms. Data are also given on mechanical tests made with 5 Surinam woods.

The direct utilization of latex in the industries, L. MORISSE (*Le Latex: Son Utilisation directe dans l'Industrie. Paris, 1908, pp. 684, figs. 17*).—This work is offered as a résumé of the present state of our knowledge relative to latex. It consists of an exposition of the advantages of the author's secret process of coagulating latex, whereby the coagulated latex may be used directly for manufacturing purposes without first being converted into crude rubber. All of the author's early and recent papers on the subject of harvesting and coagulation of latex are included, together with the reports of the purely scientific latex investigations made by the author's two principal collaborators, V. Henri and G. Vernet.

DISEASES OF PLANTS.

A method of checking parasitic diseases in plants, M. C. POTTER (*Jour. Agr. Sci., 3 (1908), No. 1, pp. 102–107*).—The author has previously shown (E. S. R., 13, p. 467) that the organism causing the white rot of turnips owes its power to the fact that it secretes an enzym which acts upon the cellulose, dissolving the middle lamella and effecting the disintegration of the cell wall, while at the same time it produces a toxin fatal to the protoplasm of its host cell. Subsequent studies with this organism (*Pseudomonas destructans*) have showed that it is possible that the toxin may be one of the waste products of bacterial metabolism.

In a series of investigations, the author grew the organism in cultures, and after considerable growth was made he sterilized the media, filtered it, and steamed it, thus destroying the enzyms and all organisms present. Turnips were then inoculated with the organism causing the white rot, and the prepared toxic solution was employed to determine whether it would check the rot after it had once become well advanced. Cultures were allowed to develop for several days, after which the toxic solution was placed on one half of an inoculated turnip, the other half remaining as a control. On the half receiving the toxic substance the growth of the organism ceased. Where weaker solutions were used the bacteria were found to be unable to grow in the solutions and they prevented further extension of the rot. The toxic solution prepared from the turnip was found not to be necessarily destructive of other organisms.

Some investigations were conducted to determine whether this curative principle would apply in other directions, and cultures were made of *Penicillium italicum* and *P. oliraceum*, which cause the rapid rotting of oranges and lemons. These fungi were grown in sterilized orange juice, and after preparation of the toxic substance a number of oranges were inoculated with the fungus. A few days later, when the characteristic color of the rot had appeared, the oranges were treated with the toxic solution and no further decay was noticed.

8880—No. 12—09——4

Mucor cultures. D. R. Sumstine (*Science, n. ser., 29 (1909), No. 737, p. 267*).—A study is reported of the common mold (*Mucor stolonifer*) made to determine the development or nondevelopment of zygospores. In all, about 2,000 cultures were examined and not a single zygospore found.

Cultures were made on different media and placed under conditions where oxygen was wanting, to determine the necessity for oxygen in the growth of zygospores, but no zygospores were obtained.

Further studies on anthracnoses. C. L. Shear and Anna K. Wood (*Abs. in Science, n. ser., 29 (1909), No. 737, pp. 272, 273*).—In continuation of previous studies (E. S. R., 18, p. 1141) 23 forms of Colletotrichum and Gloeosporium have been studied from different species of plants. Cultures have been made, the fungi compared, and cross inoculation experiments carried on, but no morphological characters have been found to be sufficiently constant to justify the segregation of species except perhaps in the case of the cotton anthracnose. The characters of *Gloeosporium* (*Glomerella*) *rufomaculans* represent fairly well the essential characters of all.

Cross inoculations from forms on fruits seem to indicate that the fungus may soon adapt itself to a different host and after a few generations develop almost as readily on one fruit as on another. All the so-called species are believed to be slightly specialized physiological forms of one omnivorous species.

Cultures of Uredineæ in 1908. J. C. Arthur (*Abs. in Science, n. ser., 29 (1909), No. 737, p. 270*).—An account is given of the tenth consecutive season's cultures of various species of rusts made from the resting as well as the summer spores. Among the various facts presented, the author states that for the first time in America the early or brown rust of rye was grown on *Anchusa* sp., being sown early in July. A similar rust on wheat failed to germinate so soon after maturity, seeming to settle the identity of the so-called *Puccinia dispersa* of Europe and America. Trials with the rust of timothy (*P. phleipratensis*) failed to infect barberry plants, in this respect agreeing with European studies.

During the season's investigation considerable information was added regarding the life history of species of Gymnosporangium, and the life cycle was demonstrated for one species from the Southern States, one from the Northern States, and one from west of the Rocky Mountains.

Notes on Sclerospora graminicola. G. B. Traverso (*Nuovo Giorn. Bot. Ital., n. ser., 14 (1907), No. 4, pp. 575–578*).—A study was made of *S. graminicola*, a common parasite of *Setaria italica*. As a result of inoculation and other experiments, the author concludes that the form commonly occurring on the Italian millet is quite distinct from the species, and he describes it as *S. graminicola setariæ-italicæ*.

A leaf blight of beans. T. Ferraris (*Riv. Patol. Veg., 3 (1909), No. 16, pp. 241–244*).—A description is given of a disease of beans in which the leaves become dried and blackened. The cause was found to be the fungus *Alternaria brassicæ phascoli*, and the disease is said to have occurred rather widely in Italy during 1908 and to have caused considerable loss. A wet spring followed by high temperatures in June and July is said to favor the development of the fungus. For the prevention of its attack spraying with Bordeaux mixture or soda Bordeaux mixture is recommended.

Artificial cultures of Phytophthora with special reference to oospores. G. P. Clinton (*Abs. in Science, n. ser., 29 (1909), No. 737, pp. 271, 272*).—In a previous report (E. S. R., 18, p. 48) the author gave the results of investigations with species of Phytophthora. In the present account he gives notes on the absence of oospores from potato mildew and their presence in other species of Phytophthora, due possibly to distinct sexual mycelia. This is indicated by observations that the antheridia and oogonia of the other two species (*P. phasc-*

oli and *P. thalictri*) are borne on separate mycelial threads. During the investigations the author cultivated pure growths of the Lima bean mildew and found that in mixed cultures oospores were always produced. Cultures are now being carried on to obtain mycelia from single spores, and if the theory of sexual mycelia is correct, these should produce no oospores.

Studies of the potato fungus (Phytophthora infestans), L. R. Jones and N. J. Giddings (*Abs. in Science, n. ser., 29 (1909), No. 737, p. 271*).—The authors state that pure cultures of the potato-rot fungus have been maintained for 4 years in the laboratories of the station. Sealed gelatin cultures have been maintained for 7 months, remaining alive but slow in starting growth.

Some noteworthy morphological characters have been observed, among them haustoria-like branches in potato tissue, the abundance of cell partitions in old cultures, an apparent differentiation into two strains, one exceeding the other in vegetative vigor, and oogonia-like bodies produced sparingly on certain media and frequently on others.

It was found that infection normally occurs through the eyes of the tubers before digging and in storage, but occasionally through wounds or lenticels. Wide differences were found between different varieties as to the ease of leaf infection and subsequent rate of spread, which leads to the conclusion that the disease resistance of the leaves may reside in the mesophyll as well as in the epidermal tissues.

Similar differences occur in the rate of development upon sterile blocks cut from the interior of the potato tubers, and these differences are not due to the acid reaction of the cell sap.

A disease of tomatoes, V. Vera (*Prog. Agr. y Pecuario, 15 (1909), No. 613, pp. 64–66, fig. 1*).—An account is given of a disease of tomatoes due to the fungus *Septoria lycopersici*. The effect of the disease on the different parts of the plant is noted with suggestions for its control. It is stated that the form present in Europe differs from that originally described as coming from Argentina and that the former is probably *S. lycopersici europeæ*.

Studies of two species of Glœosporium, E. Lasnier (*Bul. Trimest. Soc. Mycol. France, 24 (1908), No. 1, pp. 17–43, pls. 3*).—Studies were made of *G. cattleyæ* found on the leaves of certain species of Cattleya, and of *G. musarum* on banana fruits.

The morphological and biological characters of each fungus are described, and the author concludes that they are both saprophytes. The perfect form of neither species has been recognized. The characteristics, as shown in culture media, are described at length. The species occurring on orchids somewhat resembles that described by Cooke and Massee under the name *G. vanillæ*. That occurring on the banana is strictly saprophytic, attacking the fruits only after they have attained complete maturity.

Investigations on the development of Glœosporium nervisequum, A. Guilliermond (*Rev. Gén. Bot., 20 (1908), Nos. 238, pp. 385–400, pls. 3, figs. 5; 239, pp. 429–440, figs. 5; 240, pp. 449–460, pls. 6*).—A detailed study is given of the sycamore anthracnose, *G. nervisequum* or *Gnomonia veneta*, as its perfect form is known. The fungus was carefully isolated and cultivated in a number of media, but in none of them was the author able to recognize the yeast forms described by Viala and Pacottet (E. S. R., 18, p. 347). The author thinks that probably these authors had impure cultures and that the yeast and cyst forms were due to the development of some other organism. In other respects the general features of development agree.

Experiences on the control of grape downy mildew in 1908, G. Chappaz (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 30 (1909), No. 10, pp. 285–289*).—The results of spraying experiments with different fungicides for the control of

mildew in 1908 are described. These experiments were carried on in a field connected with the departmental laboratory at Châlons-sur-Marne, and the meteorological conditions are said to have been exceptionally favorable during the summer for the development of the mildew. After describing the meteorological conditions for the summer of 1908, the experiments are outlined.

In these 8 lots of vines were given different treatments. The fungicides used were neutral copper acetate and ammonia; copper acetate and liquid polysulphids; copper acetate and solid polysulphids; Burgundy mixture, sulphur, and ammonia; and some trade fungicides, the bases of which were chlorate of copper and sulphur, and bisulphite of copper and formalin. Another plat received sodium chlorate as a fungicide. Where no form of sulphur was added to the fungicide the vines received during the summer 2 or 3 applications of sublimed sulphur. In addition to the above fungicides, a test was made of a solution of sea salt, but this proved of no value as a fungicide.

In comparing the different treatments, it was found that the mixtures of neutral copper acetate and polysulphids gave the best results. In comparing the simple with the compound mixtures, the advantage was in favor of those fungicides which were compounded, receiving sulphur or polysulphids.

The mildews of the grape, I. B. P. Evans (*Transvaal Agr. Jour.*, 7 (*1909*), *No. 26, pp. 213–217, pls. 2*).—Descriptions are given of the downy mildew (*Plasmopara viticola*) and the powdery mildew of the grape (*Uncinula spiralis*), and for their control it is recommended that Bordeaux mixture be used for the downy mildew and sulphur for the powdery mildew.

Note on the European apple-tree canker fungus, I. B. P. Evans (*Transvaal Agr. Jour.*, 7 (*1909*), *No. 26, p. 217*).—A brief note is given on the occurrence of the apple-tree canker fungus (*Nectria ditissima*) in southern Africa.

Diseases of the olive, L. Navarro and E. Noriega (*Prog. Agr. y Pecuario, 15 (1909), Nos. 611, pp. 31–33, figs. 3; 612, pp. 47–49, figs. 2*).—An account is given of some new and little known fungus and insect injuries of the olive that have been observed by the authors in Seville, Spain. Among the principal fungi noted are *Glœosporium olivarum*, *Macrophoma dalmatica*, and *Cycloconium oleaginum*. In addition there are notes on the tuberculosis of the olive, the olive fly (*Dacus oleæ*) and *Diplosis oleisuga*.

The injurious action of calcium cyanamid on olive trees, F. Francolini (*Italia Agr., 1909, No. 1, pp. 12–14, pl. 1; abs. in Rir. Patol. Veg., 3 (1909), No. 17, p. 268*).—The results of 3 years' experiments are given showing the effect of calcium cyanamid on olive trees.

In 1906 one lot of trees was fertilized with 2 kg. of Thomas slag, 2 kg. of land plaster, and 1 kg. of calcium cyanamid. The check lot received 1 kg. of nitrate of soda as the source of nitrogen, and the same amounts of the other fertilizers as were given the test trees. Similar comparisons were made between nitrate of soda and calcium cyanamid in 1907 and 1908.

In every case the calcium cyanamid proved injurious to the trees, the injury being characterized by a browning of the foliage, the change of color progressing from the tip of the leaf toward its base. Later the trees lost considerable of their foliage and a large proportion of the fruit dropped from the trees. In clay soils and those rich in humus, the injury was not as pronounced as where the trees were grown in volcanic soils, which were poor in clay and lime.

A bacterial disease of the peach, J. B. Rorer (*Mycologia, 1 (1909), No. 1, pp. 23–27*).—According to the author, during the past 5 or 6 years peach growers in various sections of the country have called attention to a shot-hole disease of peaches which in wet seasons has caused a great deal of premature defoliation.

This was believed to be of bacterial origin and was so reported by Clinton in 1903 (E. S. R., 16, p. 624). The disease was again noticed in 1905, and in 1906, 1907, and 1908 the author undertook a detailed study of it throughout the South and Middle West. In these sections it proved to be the commonest shot-hole disease of peach leaves, the Cercospora leaf spot being but rarely met with. Numerous investigations showed that the disease was of bacterial origin. A bacterial disease of peach twigs and of the fruit was also found, and it seems probable that they, as well as the leaf spot, are caused by the same organism.

During the summer of 1907 a series of successful inoculation experiments with the organism was made. There appears to be but little doubt that the organism causing the leaf spot is the same as that described by Smith as *Bacterium pruni*, the cause of the bacterial black spot of plums and a plum leaf spot (E. S. R., 17, 157).

As the fruit spot was not discovered until toward the close of the peach season, little work has been done upon it.

The immunity of Coffea congensis to Hemileia vastatrix. M. Dubard (*Journ. Agr. Trop., 8 (1908), No. 96, pp. 363, 364*).—A description is given of the variety *chaloti* of *C. congensis*, which is grown at the experiment station at Tamatave, Madagascar, and which has proved to be decidedly resistant to attacks of *H. vastatrix*. This variety seems to have originated from seed that has been under observation for a number of years in Madagascar, the original coming from the Kongo region of Africa. The variety seems not only more immune, but is of decidedly better quality than the Liberian coffee, and it is believed that it can still be improved by breeding experiments.

Witches' broom disease of cacao. C. J. J. van Hall and A. W. Drost (*Rec. Trav. Bot. Néerland., 4 (1908), No. 4, pp. 243–319, pls. 17; Jour. Bd. Agr. Brit. Guiana, 2 (1909), No. 3, pp. 126–132; Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1909, No. 5, pp. 223, 224*).—A study on the origin, nature, and treatment of the witches' broom disease of cacao as it occurs in Surinam is reported.

The symptoms of the disease are summarized, from which it appears that the witches' brooms are hypertrophied branches, considerably thickened at the base, with rough surfaces. They are further distinguished by the leaves being small and stunted. Another form of the disease is characterized by the hardening of the pods, a symptom not originally associated with this disease, but usually attributed to the fungus *Phytophthora omnivora*. The third manifestation of the disease is what is designated as "star flowers." These are borne on fruit branches which present the same pathological symptoms as the witches' brooms, but they appear as an agglomeration of a large number of flowers, having among them vegetative branches transformed into small witches' brooms. They seldom give rise to ripe pods.

The disease, according to the authors, has been found to be due to the fungus *Colletotrichum luxificum*, a description of which is given.

The effects of the disease are chiefly shown in the reduction of the crop, and for its prevention severe pruning, after which the trees are to be sprayed with Bordeaux mixture, is recommended. The pruning in some of the experiments amounted to practically the cutting away of the entire top of the tree, after which all the diseased material was burned. This drastic treatment resulted in the practical loss of the crop for a year or two, but the tree recovered, and in a few years had grown well-developed tops.

So far as the authors' investigations go, other species of trees are not subject to the attack of this species of Colletotrichum, as has been currently reported.

Root rot. A. Despeissis (*Journ. Dept. Agr. West. Aust., 17 (1908), No. 1, pp. 534–540, pls. 2*).—According to the author, considerable trouble is reported in different parts of West Australia, due to the root rot of various orchard and

other trees. Investigation showed that most of it is caused by various species of mushrooms, the one most particularly concerned being the honey agaric (*Agaricus melleus*).

For the prevention of injury, the clearing of lands, in which all roots and stumps should be removed, and the draining and cultivation of the newly cleared lands are recommended. When trees are found slightly affected they can be protected to some extent by uncovering the roots, removing the diseased portions, and spraying the sound parts with fungicides.

Observations on the relation of wound parasites to the heartwood of the affected tree, P. Spaulding (*Abs. in Science, n. ser., 29 (1909), No. 737, p. 272*).—While studying various wood-rotting fungi, the author has noted an apparent relation between the wound parasites and the heartwood of diseased trees. A striking instance of this was that of *Fomes ribis* occurring on sassafras trees. In every case examined this fungus was found attacking the trees only in wounds where the heartwood was exposed by some injury. *F. igniarius*, studied upon the beech, was found to occur in a similar manner. Hundreds of blazed beech trees have been examined, but in not a single instance was the fungus found growing where the wound only extended into the sapwood. On the other hand, it was constantly found in wounds extending into the heartwood. The fungus *Polystictus versicolor* on catalpa and *F. fraxinophilus* on the white ash can be traced to the heartwood through dead stubs or wounds. In a similar way von Schrenk has called attention to the fact that *F. rimosus*, which attacks the heartwood of black locust, enters either through the dead stubs or through insect burrows.

These investigations seem to indicate that the heartwood must be exposed before these fungi are capable of attacking the hosts.

Rusts on the leaves of bamboos, S. Kusano (*Bul. Col. Agr. Tokyo Imp. Univ., 8 (1908), No. 1, pp. 37–50, pl. 1, fig. 1*).—A description is given of 5 species of Puccinia known to occur on bamboos in Japan, the species being *P. phyllostachydis*, *P. sasæ*, *P. kusanoi*, *P. kusanoi azuma*, and *P. longicornis*. Notes are included on the distribution, economic relationship, and some of the biological characters of the different species.

A new disease of oaks, A. Fiori (*Bul. R. Soc. Toscana Ort., 3. ser., 13 (1908), No. 9, pp. 266–268*).—A description is given of the mildew of oaks, which was very prevalent in the oidium stage in Europe during 1908. The author thinks that it is probably *Microsphæra quercina*, although the fruiting stage has not been found.

Oak mildew in the southwest of France, Gard (*Jour. Bot. [Paris], 21 (1908), No. 10, pp. 253–256*).—An account is given of the occurrence of mildew on oak trees in the southwest of France during the summer and autumn of 1908. The species *Quercus tozza* seemed most susceptible, although others were subject to attack. The most injury was done on the young trees, particularly where they were grown as coppice. The season seemed to have been especially favorable to the development of mildews, as the author reports mildews abundant on a number of other species of plants.

Biology of the chrysanthemum rust, S. Kusano (*Bul. Col. Agr. Tokyo Imp. Univ., 8 (1908), No. 1, pp. 27–36, fig. 1*).—A study has been made of the rusts which are known to attack various species of chrysanthemums in Japan, particular attention being paid to the black rust (*Puccinia chrysanthemi*), the white rust (*P. horiana*), and the brown rust (*Uredo autumnalis*).

The author states that there is some question as to the specific name of the first species as well as the host plants attacked. The white rust is of comparatively recent scientific knowledge, although it is said to have been known by gardeners for a considerable time. It proves very destructive, particularly on

some forms of chrysanthemums, and is much more injurious than the black rust because of its attacking the host plants while quite young and also on account of its rapid propagation. The repeated use of Bordeaux mixture is said to be very effective in preventing this rust.

All of the rusts mentioned occur on the wild chrysanthemum (*Chrysanthemum decaisneanum*). They also have a tendency to occur on *C. sinense*, although in some parts of Japan there seems to be more or less specialization regarding their hosts.

A bacterial gall of the daisy and its relation to gall formations on other plants, C. O. Townsend (*Abs. in Science, n. ser., 29 (1909), No. 737, p. 273*).—Investigations on the galls occurring on the Paris daisy have been carried on for some time by the author. After repeated efforts an organism was isolated, which has the ability to induce the formation of new galls upon healthy plants when inoculated into the stems and branches or even into the leaves of healthy daisy plants.

This organism will also produce galls upon a large number of other plants, including the tomato, potato, tobacco, sugar beet, hop, carnation, grape, raspberry, peach, and apple. The work has led to the isolation of pathogenic organisms from the galls of peach, the hard gall of apple, hairy root of apple, hop, rose, and chestnut. The organisms obtained from these galls are cross inoculable and are very similar if not identical in size, shape, structure, and habits of growth with the organism from the daisy gall.

These investigations, the author claims, leave no doubt regarding the cause of the crown gall of the peach as well as of some of the gall formations upon the apple and other economic plants.

Leaf spot of Odontoglossum, M. C. Potter (*Gard. Chron., 3. ser., 45 (1909), No. 1158, pp. 145, 146, figs. 4*).—The attention of the author has been directed to numerous black spots occurring on the lower surface of the leaves of *O. uroskinneri*. The spots are found chiefly on the older leaves, the younger ones being almost, if not entirely, unaffected.

Transverse sections through the region of the spots show an accumulation of a brown mucilaginous or gummy substance beneath the epidermis. In the initial stages this substance is present only in the respiratory cavities of the stomata, from which it exudes into the stomatal openings. In more advanced stages it collects in large masses, spreading through the hypodermal cells into the internal tissues of the leaves.

This leaf spot disease is said to differ in many respects from the common leaf spot of orchids, which is characterized by the plasmolysis of the cells.

No fungus has been found associated with this leaf spot, but numerous bacteria are present in the affected tissues. Thus far all attempts to induce the disease upon healthy plants by inoculation with bacteria have proved unsuccessful, but the author believes that bacteria play an important part in the development of the disease, particularly in the formation of the gum. It is thought that unsuitable cultural conditions are also largely responsible for the initial occurrence of the disease.

The transmissibility of the cause of olive tuberculosis to the oleander, L. Savastano (*Bol. Arbor. Ital., 4 (1908), No. 2, pp. 86, 87*).—As a result of inoculation experiments with pure cultures of the organism causing olive tuberculosis and of the insertion of fragments of olive tubercles into healthy oleander trees, the author states that the bacterial disease of the olive can not be transmitted to the oleander, as claimed by C. O. Smith (E. S. R., 18, p. 453).

Report of the Phytopathological Institute of Wageningen for 1907, J. Ritzema Bos (*Meded. Rijks Hoogere Land, Tuin en Boschbouwsch., 1908, No. 1, pp. 33–137*).—A description is given of the organization of the institute for the

study of plant diseases and reports made on a number of investigations. The diseases are grouped into nonparasitic, those due to plant parasites, those caused by insects, and those the causes of which are not definitely known.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Economic zoology, H. OSBORN (*New York, 1908, pp. XV+490, figs. 269*).—An introductory text-book in zoology, with special reference to its applications in agriculture, commerce, and medicine.

A German-French glossary of anatomical and zoological terms, R. BLANCHARD (*Glossaire Allemand-Français des Termes d'Anatomie et de Zoologie. Paris, 1908. pp. VII+298*).—In this glossary the French equivalents with family, order, or class to which the species belong are given for the German names of animals.

Catalogue of the type-specimens of mammals in the United States National Museum, including the Biological Survey collection, M. W. LYON, Jr., and W. H. OSGOOD (*U. S. Nat. Mus. Bul. 62, pp. X+325*).—This catalogue includes all type-specimens of mammals known to be in the U. S. National Museum on July 1, 1908. A total of 1,405 type-specimens are here included, of which 692 are in the collection of the Division of Mammals and 713 in the Biological Survey collection. A list is appended of 26 type-specimens that should be in the National Museum collection but of which no part can now be found.

The fauna of Mayfield's cave, A. M. BANTA (*Carnegie Inst. Washington Pub. 67, pp. 114, pl. 1, figs. 13, map 1; abs. in Science, n. ser., 29 (1908), No. 743, pp. 503, 504*).—This cave, located in Monroe County, Ind., was visited by the author on an average of once a week during some 26 months, covering different seasons of the years 1903, 1904, and 1905. The collections made are here recorded under the headings of Mammalia, Pisces, Insecta, Myriopoda, Arachnida, Crustacea, Annelida, Mollusca, and Turbellaria. Of 138 species known to exist in Indiana caves, 110 are recorded from Mayfield's cave. Descriptions by C. F. Adams of 2 new species of fungus flies (*Mycetophila analis* and *M. incerta*) are included. A bibliographic list is given of more than 130 works and papers consulted.

Annual report of the chief inspector of rabbits, A. CRAWFORD (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 6, pp. 935–939*).—The total length of rabbit-proof fence erected is said to be 2,023 miles with about 10 miles in the course of erection. Details are given of the work of the year.

Plague among the ground squirrels of California, W. B. WHERRY (*Jour. Infect. Diseases, 5 (1908), No. 5, pp. 485–506, pl. 1, map 1*).—The fact that a number of ground squirrels (*Otospermophilus beecheyi*) have been proved to be infected with *Bacillus pestis* in two widely separated sections of the State of California is considered as the most serious feature of the plague situation in this country. The Norway rat (*Mus norvegicus*) was the principal species of rodent caught in traps set well within the burrows of the ground squirrel by employed trappers. The relation between squirrel plague and the origin of certain human cases is said to have been demonstrated. Pathological and bacteriological features of the squirrel plague are here discussed.

Experiments on the use of Bacillus pestiscaviæ as a rat virus, W. B. WHERRY (*Jour. Infect. Diseases, 5 (1908), No. 5, pp. 519–553*).—In a study made of this species it was found that when ingested by young rats (*Mus norvegicus*) and mice (*M. musculus*) it is acutely pathogenic. A large percentage of adult rats are naturally immune to the infection through the gastrointestinal canal or when infected they subsequently recover.

Outbreak of illness caused by vermin-destroying virus, W. Collingridge (*Pub. Health [London], 22 (1908), No. 3, pp. 94–96*).—An outbreak of illness was traced to the virus that had been used for the destruction of rodents.

The birds of Tierra del Fuego, R. Crawshay (*London, 1907, pp. XL+158, pls. 44, fig. 1, map 1*).—Six months were spent by the author in the investigations here reported. In the preface the author briefly considers the flora and fauna including the mammals, fishes, spiders, insects, etc. Birds are the most important fauna of all, although the majority are only summer visitors. Thirteen orders and 79 species of birds are considered.

Nests of the barred owl, red-shouldered hawk, and barn owl on Staten Island, in 1907, J. Chapin (*Proc. Staten Isl. Assoc. Arts and Sci., 2 (1907–8), No. 1, pp. 3–8*).—Notes are given on the habits of *Syrnium varium*, *Buteo lineatus*, and *Strix pratincola*.

The food of some British birds, R. Newstead (*Jour. Bd. Agr. [London], 15 (1908), No. 9, Sup., pp. VIII+87*).—A memoir based upon 871 post-mortem examinations of the stomach contents and the pellets or castings of 128 species of British birds.

"We find that insects occurred in about 41 per cent of the total number of post-mortem records and pellets. If we eliminate the finches, the hawks and owls, ducks, geese, divers and the oceanic birds from this total, we find that the insects forming the whole or part of the dietary of the remaining birds amounts to between 70 and 75 per cent; and it is important to note that those insects which are included in the injurious group vastly outnumber those which may be considered beneficial, and are almost twice as numerous as the beneficial and the innoxious groups combined."

Philippine ornithological literature, I, R. C. McGregor (*Philippine Jour. Sci., A. Gen. Sci., 3 (1908), No. 4, pp. 285–292*).—This list of 50 titles is said to be the first of a series of papers having for its final object a complete bibliography of Philippine ornithology.

Notes on a collection of birds from Siquijor, Philippine Islands, R. C. McGregor (*Philippine Jour. Sci., A. Gen. Sci., 3 (1908), No. 4, pp. 275–281*).—A list with notes on species of birds collected from Siquijor, a coral rock island with an area of about 235 sq. km. (about 91 sq. miles) which lies in close proximity to the large island of Negros.

Priority and practical entomology, H. M. Lefroy (*Jour. Econ. Biol., 3 (1908), No. 4, pp. 105–112*).—The author here reviews many of the changes which have been made in the names of insects of economic importance and suggests methods by which the names of the more important insects could be standardized.

Insects: The rôle they play in the transmission of disease, H. Albert (*Bien. Rpt. Bd. Health Iowa, 14 (1908), pp. 136–144*).—A general discussion of insect transmission of disease.

How best to control and eradicate insect enemies and pests, F. Whiteside (*Bien. Rpt. Mont. Bd. Hort., 5 (1907–8), pp. 24–63, figs. 18*).—An account is given of the more important insect enemies and diseases of fruits with methods of control. A spray calendar is appended.

New pests we should guard against, E. M. Ehrhorn (*Cal. Fruit Grower, 38 (1908), No. 1066, pp. 10–13*).—Among the insects which have not yet been introduced into California and which are to be guarded against, the author mentions the terrapin scale or peach lecanium (*Eulecanium nigrofasciatum*), scurvy bark louse, the West Indian peach scale (*Aulacaspis pentagona*), maple scale (*Phenacoccus acericola*), pear tree psylla (*Psylla pyricola*), cigar case bearer (*Coleophora fletcherella*), the bud moth (*Tmetocera ocellana*), Japanese apple fruit borer (*Laverna herellera*), pear fruit borer (*Nephopteryx rubri-*

zonella), gipsy moth, brown-tail moth, squash borer (*Melittia satyriniformis*), peach root borer (*Sanninoidea exitiosa*), fall webworm, bagworm, and peach sawfly (*Pamphilius persicum*).

A preliminary bulletin on some economic insects and plant diseases of Indiana, B. W. Douglass (*Indianapolis, Ind., 1907, pp. 28, figs. 8*).—A brief account of the more important insects and plant diseases including methods of treatment.

The principal insects injurious to horticulture during 1906–7, M. H. Swenk (*Bul. Nebr. State Hort. Soc., No. 19, pp. 24, figs. 31*).—In this bulletin, which forms part 1 of the report of the State entomologist, the author considers the insects which have been actively injurious to horticulture in Nebraska during the 2 years ended April 1, 1908. These are the codling moth, lesser apple worm, leaf crumpler (*Mineola indiginella*), white-marked tussock-moth (*Homerocampa leucostigma*), apple-tree tent-caterpillar, yellow-necked apple-tree caterpillar (*Datana ministra*), pear slug (*Eriocampoides limacina*), rose slug (*Monostegia rosæ*), leaf-cutter bees (*Megachile* spp.), buffalo tree-hopper (*Ceresa bubalus*), snowy tree cricket (*Œcanthus niveus*), plum curculio, and plum gouger.

Scale insects injurious in Nebraska during 1906–7, H. S. Smith (*Bul. Nebr. State Hort. Soc., No. 20, pp. 16, figs. 6*).—This bulletin forms part 2 of the report of the State entomologist.

While the San José scale does not occur in Nebraska, several other species are a source of injury. The oyster-shell scale was the cause of considerable injury to apple trees during the 2 years under report. The scurfy scale is not as common as *Lepidosaphes ulmi* and rarely does much injury. The elm-tree white-scale (*Chionaspis americana*) occasionally becomes injurious to the common elm. The pine leaf scale (*C. pinifoliæ*) is said to be a very common species of both native and cultivated conifers. The cottonwood scale (*C. ortholobis*) has been quite abundant in eastern Nebraska for several years on young poplars, cottonwood, and willow. The cottony maple scale has not been sufficiently abundant during the past 2 years to cause much injury. During the summer of 1907 the western cottony grass scale (*Eriopeltis coloradensis*) became prevalent on wild wheat grass in the southwestern portion of the State. Several parasites of this scale have been bred by the author from the egg sacs, the most common being the dipterous parasite, *Leucopis nigricornis*.

Injurious insects and other animals observed in Ireland during the year 1907, G. H. Carpenter (*Econ. Proc. Roy. Dublin Soc., 1 (1908), No. 15, pp. 559–588, pls. 6, figs. 10*).—Insects of the year are reported under the following headings: Parasites of domestic animals, corn insects, clover, cabbage, and mangold insects, potato and parsnip insects, tobacco insects, orchard insects, hawthorn insects, and forest insects.

Insect investigations in Mexico, A. Koebele (*Hawaii. Planters' Mo., 27 (1908), No. 12, pp. 507–513*).—This is an account of investigations made in Mexico by the author.

The moth borer (*Diatræa saccharalis*) is said to be widely distributed in the country. It is stated that 50 per cent of the eggs deposited are destroyed by a parasite (*Trichogramma pretiosa*). While the pest does not occur in Hawaii, it seems quite probable that it will be sooner or later introduced, as it is a species widely distributed.

The large Mexican sugar-cane leaf-hopper (*Cyrtodisca major*) is said to be injurious in the State of Morelos. The Mexican sugar-cane hopper (*Cyrtodisca* sp.) is widely distributed, breeding throughout the year. Its eggs are destroyed to a large extent by fungus diseases and parasites. Other injurious

insects commonly found in cane fields include an earwig (*Sphingolabis forniata*), the chinch bug (*Blissus leucopterus*), and jassid and fulgorid leaf hoppers.

Report of the entomologist and vegetable pathologist. H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1907–8, pp. 84–92*).—A brief account is given of the more important insects, insectivorous birds, and plant diseases of the year. These are grouped under insects affecting agricultural crops, useful insects, insects and ticks affecting stock, human ecto-parasites, diseases of agricultural crops, and diseases of horticultural crops. An account is also given of the inspection and disinfection of plants exported and imported during the year.

Annual report of the assistant entomologist. L. J. Newman (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 6, pp. 940–944*).—An account is given of work with parasites of the fruit fly, cabbage aphis, scales, etc., and with lady beetles. The prevalence of and injury by the more important insect pests are briefly considered.

Insects and other Arthropoda collected in the Congo Free State. R. Newstead, J. E. Dutton, and J. L. Todd (*Ann. Trop. Med. and Par., 1 (1907), No. 1, pp. 3–113, pls. 6, figs. 21, maps 2*).—Insects of the families Culicidæ, Chironomidæ, Psychodidæ, Simulidæ, Tabanidæ, Sarcophagidæ, Muscidæ (particularly tsetse flies), Hippoboscidæ, Pulicidæ, Cimicidæ, and several families of the Acarina, including Ixodidæ, are included in this account.

A guide to the study of Australian butterflies. W. J. Rainbow (*Melbourne, 1907, pp. 272, pls. 7, figs. 262*).—A small guide intended for beginners.

Notes on the life histories of certain wood-boring lepidoptera. F. X. Williams (*Ent. News, 20 (1909), No. 2, pp. 58–62, pl. 1*).—The species here noted are *Vespamima sequoiæ*, *Sesia mellinipennis*, *S. polygoni*, and *Pterophorus baccharides*.

Notes on the study of some Iowa Catocalæ. R. R. Rowley (*Ent. News, 20 (1909), No. 1, pp. 12–18*).—Notes on food plants are included in this account.

The fauna of British India, including Ceylon and Burma. Coleoptera (*London, 1906, vol. 1, pp. XVIII+329, figs. 107; 1908, vol. 2, pp. XX+534, pls. 2, figs. 172*).—Volume 1 on the Cerambycidæ is by C. J. Gahan and volume 2 on the Chrysomelidæ is by M. Jacoby.

The distribution of the North American species of Phytonomus. R. L. Webster (*Ent. News, 20 (1909), No. 2, pp. 80–82*).—A brief account of the distribution of the weevils belonging to the genus Phytonomus.

Notes on Tenthredinoidea, with description of new species, II, III, IV, V. S. A. Rohwer (*Canad. Ent., 41 (1909), Nos. 1, pp. 9–21; 3, pp. 88–92; 4, pp. 106–112; 5, pp. 145–149*).—In these papers species and varieties from Colorado, California, Nebraska, Nevada, New Mexico, Kansas, and the District of Columbia are described as new. The new genus Protemphytus is also erected.

A note on the habits of Aphilanthops. C. N. Ainslie (*Canad. Ent., 41 (1909), No. 3, pp. 99, 100*).—The author reports observing the wasp *Aphilanthops taurulus* capture and carry away *Pogonomyrmex barbatus* at Albuquerque, New Mexico.

Notes on some Chalcidoidea. J. C. Crawford (*Canad. Ent., 41 (1909), No. 3, pp. 98, 99*).—*Megorismus fletcheri* bred from *Nectarophora pisi* at Ottawa, Canada, is described as new. The new genus Hemadas is erected of which *Megorismus nubilipennis* is designated as the type species. A table is given for the separation of the various genera of the tribe.

Two new seed-infesting chalcis flies. C. R. Crosby (*Canad. Ent., 41 (1909), No. 2, pp. 50–55, figs. 2*).—*Prodecatoma phytophaga*, reared from the seeds of the Virginia creeper (*Parthenocissus quinquefolia*), and *Eurytoma rhois*, reared

from seeds of the sumac (*Rhus hirta*), which were collected at Ithaca and Taughannock Falls, N. Y., are described as new to science.

A key to the species of Prospaltella, with table of hosts, and descriptions of four new species. L. O. HOWARD (*Ann. Ent. Soc. Amer., 1 (1908), No. 4, pp. 281–284*).—The species *Prospaltella quercicola* reared from *Aleyrodes gelatinosus*, *P. koebelei* from *Aspidiotus longispina*, *P. citrella* from *Aleyrodes coronatus*, and *P. brunnea* from a species of Aleyrodes are described as new to science.

Comparative ethology of the European and North American ants. W. M. WHEELER (*Jour. Psychol. u. Neurol., 13 (1908), pp. 404–435, pls. 2, figs. 6*).—The author first considers the composition of the European and North American ant fauna. For America north of Mexico 450 species, subspecies, and varieties belonging to 63 genera and subgenera are said to have been listed by the author. As a number of forms remain to be described, it is estimated that the total number will exceed 500. It is considered certain that the North American ant fauna is more than twice as rich as that of Europe. Fossil ants, the nidification of the European and North American ants, the parasitic ants of Europe, and Myrmecophiles are considered at some length.

Honey ants, with a revision of the American Myrmecocysti. W. M. WHEELER (*Bul. Amer. Mus. Nat. Hist., 24 (1908), pp. 345–397, figs. 28*).—To this account is appended a bibliographical list of 49 titles.

The ants of Casco Bay, Maine, with observations on two races of Formica sanguinea Latreille. W. M. WHEELER (*Bul. Amer. Mus. Nat. Hist., 24 (1908), pp. 619–645*).—Data are included on the habits of some of the species here listed.

The ants of Texas, New Mexico, and Arizona, I. W. M. WHEELER (*Bul. Amer. Mus. Nat. Hist., 24 (1908), pp. 399–485, pls. 2*).—One hundred and one species, subspecies, or varieties are here considered.

The ants of Porto Rico and the Virgin Islands. W. M. WHEELER (*Bul. Amer. Mus. Nat. Hist., 24 (1908), pp. 117–158, pls. 2, figs. 4*).—"Of the 65 species, subspecies, and varieties of these insects recorded, 12 have been found only in St. Thomas, 4 only on Culebra, and 21 only on Porto Rico; 11 are common to Culebra and Porto Rico, 5 to St. Thomas and Porto Rico, and 12 occur on all three of the islands."

The ants of Jamaica. W. M. WHEELER (*Bul. Amer. Mus. Nat. Hist., 24 (1908), pp. 159–163*).—"Of the 40 enumerated forms, 9, or nearly 25 per cent, are well-known cosmopolites, and nearly half of the remainder are widely distributed through the West Indies and adjacent South and Central American countries."

The fauna of British India, including Ceylon and Burma. Rhynchota. W. L. DISTANT (*London, 1908, vol. 4, pp. XV+501, figs. 282*).—This, the fourth volume of the Rhynchota, deals with the Membracidæ, Cercopidæ, and Jassidæ. In the appendix are included such species of the Pentatomidæ, Coreidæ, and Berytidæ as have been added to the Indian fauna since the publication in 1902 of volume 1 of the Rhynchota.

A catalogue of the hemiptera of Fiji. G. W. KIRKALDY (*Proc. Linn. Soc. N. S. Wales, 33 (1908), pt. 2, pp. 345–391, pl. 1, figs. 5*).—This list, based mainly upon collections from 3 islands, increases the number of known Fijian hemiptera from the previous total of 40 species to 202 species. Notes are included on the food plants of some of the species.

Life histories of some Philippine Cassididæ. W. SCHULTZE (*Philippine Jour. Sci., A. Gen. Sci., 3 (1908), No. 4, pp. 261–271, pls. 6*).—Life-history notes are given on the species *Prioptera sinuata*, *P. schultzei*, *Aspidomorpha miliaris*, *Cassida picifrons*, *Metriona trivittata*, and *Lacoptera philippinensis*. The *M.*

trivittata larvæ were often found infested by a fly and pupæ of *A. miliaris* by a chalcidid. The eggs of but one species, *L. philippinensis*, were found parasitized.

Studies on Aphididæ, I. J. J. Davis (*Ann. Ent. Soc. Amer., 1 (1908), No. 4, pp. 251–264, pls. 3*).—Studies of the habits, with descriptions of the life stages of *Myzus ribagni*, the barberry plant louse (*Rhopalosiphum berberidis*), the yellow clover plant louse (*Callipterus trifolii*), and the red clover aphis (*Aphis bakeri*).

Phyllaphis coweni, C. P. Gillette (*Canad. Ent., 41 (1909), No. 2, pp. 41–45, fig. 1*).—Notes are given upon the life history of this species of plant louse. Bearberry (*Arctostaphylos uva-ursi*) is said to be the host plant.

The Lecanium of Robinia, P. Marchal (*Compt. Rend. Soc. Biol. [Paris], 65 (1908), No. 24, pp. 2–5*).—After considering the origin of the locust scale (*Lecanium robiniarum*), the author presents the details of a breeding experiment, in which he shows this scale to be a variety of *L. corni*. For this variety he proposes the name *L. corni robiniarum*.

On Thysanoptera, II. J. Franklin (*Ent. News, 20 (1909), No. 5, pp. 228–231*).—The genus Aleurodothrips is erected for the species *Cryptothrips fasciapennis*. This species has been found feeding upon the eggs, larvæ, and pupæ of the citrus white fly (*Aleyrodes citri*).

A report on the species of Siphonaptera found within the boundaries of the city and county of San Francisco, Cal., C. Fox (*Ent. News, 20 (1909), No. 1, pp. 10, 11*).—Seventeen species, representing 9 genera, were recognized among some 17,000 specimens collected.

Revision of the noncombed eyed Siphonaptera, K. Jordan and N. C. Rothschild (*Parasitology, 1 (1908), No. 1, pp. 1–100, pls. 7*).—A bibliography is appended to this revision.

Two little-known aphids on Carex sp., C. P. Gillette (*Ent. News, 20 (1909), No. 3, pp. 119–121, pl. 1*).—The author reports the collection of an alate viviparous female of *Brachycolus ballii* from Carex and presents a description of it. *Callipterus flabellus* was taken in large numbers from a small species of Carex. Descriptions of adult apterous viviparous and winged females are accompanied by illustrations.

The preparatory stages of Euchloe sara, K. R. Coolidge and E. J. Newcomer (*Canad. Ent., 41 (1909), No. 2, pp. 45–47*).—Notes are given upon the life history and habits of this species, which occurs in California on species of Brassica and other Cruciferæ.

Weevils and other insects affecting grains and cereal products, R. Ramírez (*Estac. Agr. Cent. [Mexico] Circ. 5, pp. 5, pls. 6*).—A general account of these insects.

Notes on Contarinia sorghicola, G. W. Herrick (*Ent. News, 20 (1909), No. 3, pp. 116–118, pl. 1*).—This cecidomyid is reported as the source of widespread injury to the seed of Kafir corn and sorghum in Texas. Parasites of the species *Aprostocetus diplosidis* were bred in large numbers from it. The pest is difficult to control. It is suggested that the parasites may increase sufficiently as the season advances to enable a late crop of Kafir corn to mature its seed.

Poisoned bait remedy [for cutworms], C. W. Mally (*Agr. Jour. Cape Good Hope, 33 (1908), No. 5, pp. 628–635, figs. 3*).—The remedy here described consists of cutting up any available green stuff as lucern, barley, forage, cabbage or rape leaves, young succulent weeds, etc., into lengths of about ½ in. moistening with poisoned sweet and scattering broadcast in cabbage, tomato, tobacco, and other infested fields. A mixture of arsenite of soda, 1 lb., molasses or brown sugar, 8 lbs., and water, 10 gal., has been used in which to moisten the green stuff. Ants, and a bacterial disease are mentioned as enemies of cutworms.

Preliminary report upon experiments with powdered arsenate of lead as a boll weevil poison, W. NEWELL and T. C. BARBER (*Crop Pest Com. La. Circ. 23, pp. 9–10, figs. 3*).—The authors first present a brief review of the use of Paris green in combating the boll weevil. At their request one firm attempted and, after some experimentation, succeeded in the spring of 1908 in producing a powdered arsenate of lead. Experiments carried out with this insecticide are reported in which it was found to be twice as effective as Paris green, and that if applied to cotton just before the first squares form 70 per cent of the boll weevils then present would be killed. Conclusions as to the probable profit following such application should be drawn with caution, since all the boll weevils are not out of hibernation when the squares first appear. For the destruction of the cotton caterpillar or leaf worm in midsummer, powdered arsenate of lead is preferred to Paris green since it is equally as effective, is noninjurious to the cotton plant, and is cheaper. Powdered arsenate of lead is also considered a better application for the bollworm than is Paris green.

Destroying the boll weevils before they enter hibernation, W. NEWELL (*Crop Pest Com. La. Circ. 24, pp. 41–48*).—Attention is called to the importance of fall destruction of cotton stalks. Early and complete destruction is shown to be a necessary precedent to the successful use of powdered arsenate of lead the following spring.

What constitutes a perfect stand of cotton when fighting the boll weevil? W. NEWELL (*Crop Pest Com. La. Circ. 25, pp. 15*).—In sections infested by the boll weevil, cotton bolls are not made after August 15 (and oftentimes none after August 1) and therefore each plant requires only enough growing room in which to produce bolls up to the date of maximum infestation, about August 15. Having in mind these facts, the author conducted experiments to determine what constitutes a perfect stand, by this being meant the number of plants on any given area which will give the greatest yield per acre. A summary of the comparative production of widely spaced and closely spaced cotton is presented in the following table:

Comparative production of cotton in wide rows, in narrow rows, and in rows of medium width.

Experiment.	Yield of seed cotton per acre.		
	Widely spaced.	Closely spaced.	Medium distance.
	Pounds.	*Pounds.*	*Pounds.*
Mansfield, 1907	734	947	892
Mansfield, 1908	838	1,341	993
Mansura, 1908	474	627	392
Bayou Pierre, 1908	380	636	553
Average yield, all experiments	607	889	708

These experiments were conducted on such a variety of soils and under such a variety of conditions that the results are considered trustworthy.

"From our own experience we are inclined to believe that spacing about as follows will give the maximum yields per acre under ordinary conditions:

"On poor upland soil, rows 3 ft. apart, plants 10 in. apart in the row. On rich upland or good prairie soils, rows 3 ft. apart, plants 12 in. apart in the drill. For worn, or very sandy bottom lands, rows 3½ ft. apart, plants 12 in. apart in the drill. On bottom lands of medium fertility, well drained, rows 4 ft. apart, plants 15 in. apart in the drill."

Maize stalk borer (Sesamia fusca). C. W. Mally (*Agr. Jour. Cape Good Hope, 33 (1908), No. 5, pp. 616–624, figs. 2*).—A general account is given of this pest, including methods of control.

Insect enemies of cotton. F. Sherman, Jr. (*Bul. N. C. Dept. Agr., 29 (1908), No. 6, pp. 54, figs. 24*).—This is an account of the more important cotton insects, their biology, injury, and remedies. The author considers $2,000,000 a conservative estimate of the injury annually done to cotton in North Carolina by insects.

Cutworms are the source of considerable injury, particularly in the Piedmont counties. Of 7 species reared to maturity, 4 are reported as having reached the moth stage in spring, and 2 in fall, while 1 was observed in summer only. Injury by the cotton leaf-louse (*Aphis gossypii*) is said to be rather general throughout the cotton-growing regions of the State. *Aphis maidiradicis* has been reported from several counties as the source of injury.

The cowpea pod weevil (*Chalcodermus æneus*) was reported in 1907 from several counties as injurious to cotton. The new cotton beetle (*Lupcrodes brunneus*) has been the source of considerable damage to blooms and squares. The cotton red spider (*Tetranychus gloveri*) has been at times a source of injury, principally in a belt about two counties wide extending across the State from north to south. The cotton worm (*Alabama argillacea*) has not often been destructive in the State. The bollworm while not considered a serious enemy of cotton in North Carolina does some damage every year. The boll weevil is not as yet known to occur in the State. Several cotton insects of lesser importance are also considered.

Notophallus hæmatopus attacking peas in France. P. Marchal (*Bul. Soc. Ent. France, 1908, No. 3, pp. 41, 42*).—This acarid is described as causing considerable injury to peas near Gien in central France.

Further biological notes on the Colorado potato beetle (Leptinotarsa decemlineata), including observations on the number of generations and length of the period of oviposition. A. A. Girault (*Ann. Ent. Soc. Amer., 1 (1908), No. 2, pp. 155–178*).—A continuation in 1907 at New Richmond, Ohio, of observations made during 1906 in Georgia, previously noted (E. S. R., 19, p. 159).

Contribution to the study of the sugar-cane borers. N. Lévy (*Bol. Min. Fomento [Peru], Dir. Fomento, 6 (1908), No. 7, pp. 1–4*).—The species *Diatræa striatalis* and *Sesamia nonagrioides* var. *albiciliata* are here considered.

Paper on the frog hopper. J. J. McLeod (*Proc. Agr. Soc. Trinidad and Tobago, 8 (1908), No. 12, pp. 552–556*).—An account is given of part of the life history of a Trinidad species of cercopid, which the author considers the principal cause of the injury and disease of sugar cane throughout the island. As a remedy it is recommended that the fields be burned over as soon as the canes are cut and that badly infested fields be allowed to lie fallow for at least a year.

Insects injurious to tobacco. G. E. Anastasia (*Bol. Tec. Coltiv. Tabacchi [Scafati], 7 (1908), No. 2, pp. 107–114, pl. 1*).—In this article the author considers the Thysanoptera or thrips known to injure tobacco, the nature of their injury, natural enemies, and methods of control.

A new vegetable pest—the tomato weevil. C. French, Jr. (*Jour. Dept. Agr. Victoria, 6 (1908), No. 12, pp. 754, 755*).—*Desiantha nobica*, a species of weevil recently described as new, is reported to have fed upon and destroyed great numbers of tomato and other garden plants.

The Japanese Coccidæ. T. D. A. Cockerell (*Canad. Ent., 41 (1909), No. 2, pp. 55, 56*).—Notes on a number of species.

The San José scale (Aspidiotus perniciosus) and methods of treatment. A. E. Stene (*Ann. Rpt. Bd. Agr. R. I., 23 (1907), App., pp. 1–91, pls. 19, figs.*

30).—A general account of this insect including its natural enemies and methods of control.

The fruit-infesting forms of the dipterous genus Rhagoletis, with one new species, J. M. Aldrich (*Canad. Ent., 41 (1909), No. 2, pp. 69–73, fig. 1*).—Notes and a table are given for the separation of the species of this genus of fruit flies.

Annual report of the chief orchard inspector, T. Hooper (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 6, pp. 933–935*).—A remarkable reduction from that of the previous year is reported in the quantity of fruit destroyed by the fruit fly. The use of kerosene for the destruction of these flies is considered as a valuable discovery, as many flies have been destroyed by it. A brief account is given of the more important orchard insects of the year.

Observations on the oviposition of Œcanthus quadripunctatis Beutenmüller, J. P. Jensen (*Ent. News, 20 (1909), No. 1, pp. 25–28, pl. 1*).—Injury to blackberry and raspberry canes is said to be due to *O. quadripunctatis* and not to *O. niveus*.

The woolly aphis of the apple tree, J. R. Inda (*Estac. Agr. Cent. [Mexico], Circ. 2, pp. 6, pl. 1*).—This is a general account including remedies for *Schizoneura lanigera*.

The apple blossom weevil, W. E. Collinge (*Jour. Bd. Agr. [London], 15 (1908), No. 9, pp. 674–678*).—An account of the life history and bionomics and of preventive and remedial measures for *Anthonomus pomorum*.

[The olive fly and methods of control] (*Ann. Agr. [Italy], 1908, No. 256, pp. 34–79*).—In the proceedings of the annual meeting of the Consultative Commission of Olive Culture and Oil Manufacture, reports are given by Profs. Berlese, Silvestri, and others on investigations of the value of parasites, sweetened arsenicals, etc., in combating the olive fly and *Lecanium oleæ*.

Some new and undescribed insect pests affecting cocoa in West Africa, W. M. Graham (*Jour. Econ. Biol., 3 (1908), No. 4, pp. 113–117, pls. 2, fig. 1*).—A capsid belonging to an undetermined genus, *Chryphalus horridus*, and *Ceratitis anonæ* are described as new to science.

On a new species of Kermes destructive to oak trees in North India, E. E. Green (*Ent. Mo. Mag., 2. ser., 20 (1909), No. 229, pp. 10–12, figs. 4*).—The species here described (*Kermes himalayensis*) is reported as killing oaks (*Quercus incana*) over a considerable area.

The large larch sawfly, C. G. Hewitt (*Jour. Bd. Agr. [London], 15 (1908), No. 9, pp. 649–660, pl. 1, map 1*).—The author here considers the life history of *Nematus erichsonii*, the nature and effects of its attack, its occurrence, natural enemies, and remedial and preventive measures. Birds and the field vole (*Microtus [Arvicola] agrestis*) are reported to be the most important factors in the natural control of this pest. In two lots of cocoons examined, 3.4 and 9.5 per cent, respectively, were found parasitized by the ichneumon *Mesoleius audicus*.

The Monterey pine resin midge (Cecidomyia resinicoloides n. sp.), F. X. Williams (*Ent. News, 20 (1909), No. 1, pp. 1–8, pl. 1*).—The author here presents an account of the life history and habits of a species new to science.

Biological studies on bark beetles, C. Hennings (*Naturw. Ztschr. Forst u. Landw., 5 (1907), Nos. 1, pp. 66–75; 2, pp. 97–125; 12, pp. 602–608, fig. 1; 6 (1908), No. 9, pp. 469–486, fig. 1*).—In part 1 of this report the biology of *Tomicus typographus* is considered. In part 2, *Ips typographus*, *I. sexdentatus*, and *Myelophilus piniperda* are briefly considered. Part 3 has been previously noted (E. S. R., 20, p. 559). Part 4 is devoted to a discussion of the life histories and feeding habits of bark beetles.

The fumigation of nursery stock, B. W. Douglass (*Ind. State Ent. Bul. 2, pp. 9, figs. 3*).—During the summer of 1907 over 30 nurseries in Indiana were found infested with the San José scale. The author describes a fumigation house of concrete that was built for a nursery man at a total cost of less than $100. Photographs are given of the house while under construction and after completion.

Attention is called to the fact that the formula given for fumigation is based upon the chemically pure potassium cyanid and not upon the commercial brand, which averages less than 50 per cent pure. Examinations made of samples of potassium cyanid obtained from nurseries over the State where fumigation is carried on show that as a rule the article sold by the average druggist is of the commercial grade.

Directions are given by the author for the fumigation of stock and by W. C. Reed for the fumigation of buds and scions.

Descriptions of some new species and a new genus of American mosquitoes, H. G. Dyar and F. Knab (*Smithsn. Misc. Collect., 52, No. 1813, pp. 253–266, fig. 1*).—The genus Dianamesus based upon the new species *D. spanius* which was collected in the Canal Zone, Panama, is described as new to science. Thirty-five species belonging to the genera Aedes, Bancroftia, Culex, Deinocerites, Wyeomyia, and Limatus are also described as new.

Mosquito comment, H. G. Dyar and F. Knab (*Canad. Ent., 41 (1909), No. 3, pp. 101, 102*).—*Culex trachycampa* from the Canal Zone, Panama, and *Aedes sansoni* from Banff, Alberta, Canada, are described as new.

On the larval and pupal stages of Anopheles maculipennis, A. E. Mms (*Pt. 1, Jour. Hyg. [Cambridge], 7 (1907), No. 2, pp. 291–318, pls. 2; pt. 2, Parasitology, 1 (1908), No. 2, pp. 103–133, pls. 2*).—The author presents a detailed description of the internal structure of the larva and pupa of this mosquito. A bibliography is appended to each part.

Biology of Philippine Culicidæ, C. S. Banks (*Philippine Jour. Sci., A. Gen. Sci., 3 (1908), No. 4, pp. 235–258, pls. 10*).—Studies were made on the life history and habits of *Worcesteria grata, Desvoidya jolonsis, Stegomyia persistans, S. samarensis, Hulecatomyia pseudotæniata*, the filaria mosquito (*Culex fatigans*), *Banksinella lutcolateralis, Mansonia annulifera*, and *M. uniformis*. The larvæ of *W. grata* are said to destroy enormous numbers of those of other species. It is the author's opinion that *Mansonia uniformis* plays a rôle in the transmission of dengue fever as important as does *Culex fatigans*.

New Philippine mosquitoes, C. S. Ludlow (*Canad. Ent., 41 (1909), No. 3, p. 97*).—A new species of mosquito collected at Parang, Mindanao, P. I., is described as *Oculiomyia fulleri*.

Millions and mosquitoes, H. A. Ballou (*Imp. Dept. Agr. West Indies Pamphlet 55, 1908, pp. 16, fig. 1; West Indian Bul., 9 (1909), No. 4, pp. 382–390, figs. 4*).—An account is given of a species of small fish (*Girardinus pœciloides*), commonly known as million, which largely assists in keeping some species of mosquitoes in check through feeding upon the eggs, larvæ, and pupæ. This fish has recently been introduced into St. Kitts-Nevis, Antigua, Jamaica, St. Vincent, St. Lucia, and Guayaquil, and also into British Guiana, Colon, and Bolivar.

A note upon the possibility of the mosquito acting in the transmission of leprosy, W. R. Brinckerhoff (*Washington, D. C.: Pub. Health and Mar. Hosp. Serv. U. S., 1908, pp. 22–24*).—The author has found *Culex pipiens* to defecate during the process of blood sucking in a way very similar to *Myzomyia ludlowii* as observed by Banks. Such a habit makes it mechanically possible for mosquitoes to carry lepra bacilli from lepers to well persons and highly

probable that if so carried the bacilli will be rubbed into the skin of the person bitten.

Bibliography on flies and mosquitoes as carriers of disease, W. P. Gerhard (*Ent. News, 20 (1909), Nos. 2, pp. 84–89; 5, pp. 207–211*).—One hundred and nine titles are listed.

A preliminary account of the biting flies of India, H. M. Lefroy (*Agr. Research Inst. Pusa [India] Bul. 7, 1907, pp. III+45+II, pls. 4, figs. 32*).—In this preliminary account the author considers briefly the classification, life histories, and habits of the blood-sucking flies.

A new species of Ceratophyllus, C. Fox (*Ent. News, 20 (1909), No. 3, pp. 107–110, figs. 3*).—A new species of flea taken from *Microtus californicus* and also from the nest of a wood rat (*Neotoma* sp.) is here described as *C. multidentatus*.

The tumbu-fly (Cordylobia anthropophaga), E. E. Austen (*Jour. Roy. Army Med. Corps, 10 (1908), No. 1, pp. 18–24, figs. 2*).—An account of the life history and habits of a fly found in Central and South Africa which in the maggot stage burrows beneath the skin of human beings, monkeys, dogs, and other animals.

Description of two new species of African ticks, G. Neumann (*Ann. Trop. Med. and Par., 1 (1907), No. 1, pp. 115–120, figs. 4*).—*Rhipicephalus duttoni* taken from a bovine at Zambie and *R. longus* from a bovine at Kasongo are here described as new.

The structure and biology of Hæmaphysalis punctata, I, G. H. F. Nuttall, W. F. Cooper, and L. E. Robinson (*Parasitology, 1 (1908), No. 2, pp. 152–181, pls. 5, figs. 9*).—An account is given of this European species which is widely distributed, though never very numerous. The great majority of these ticks received by the authors were taken from sheep, though specimens were also received that had been taken from goats and ferrets.

Experimental studies on the transmission of recurrent fever by ticks, B. Möllers (*Ztschr. Hyg. u. Infectionskrank., 58 (1908), No. 2, pp. 277–286; abs. in Bul. Inst. Pasteur, 6 (1908), No. 21, p. 964*).—Experiments conducted with *Ornithodoros moubata* brought back by Koch from German East Africa are reported. The author presents data on the life history and habits of this tick and reports experiments in which recurrent fever was transmitted to monkeys. Larvæ from infected females were found to transmit the disease.

Spirochetosis transmitted in Tunis by Argas persicus, B. Galli-Valerio (*Centbl. Bakt. [etc.], 1. Abt., Orig., 47 (1908), No. 4, pp. 494, 495.*)—The author has demonstrated the occurrence of *Spirochæta gallinarum* in Tunis and that *A. persicus* is the active agent in its transmission.

Mycetozoan endoparasites of insects. I, Sporomyxa scauri, n. g. and n. sp., L. Léger (*Arch. Protistenk., 12 (1908), No. 1–2, pp. 109–130, figs. 3*).—The species here reported is a parasite of the tenebrionid beetle *Scaurus tristis*. The specimens studied came from Algeria, particularly the province of Oran, where this parasite appears to be widely distributed. As a result of infestation the reproductive organs of the host are said to be destroyed.

The house cockroach, J. R. Inda (*Estac. Agr. Cent. [Mexico] Bol. 7, pp. 16, pl. 1*).—*Ectobia germanica* is the species here considered.

Descriptions and records of bees, T. D. A. Cockerell (*Ann. and Mag. Nat. Hist., 8. ser., 2 (1908), No. 10, pp. 323–334*).—A list of fossil Bombiform bees, a general scheme of relationships, and a description of a new fossil species are given. Records of bees collected in Colorado, descriptions of several new species, and a table for the separation of bees in the Foxii group of Nomia follow.

Report of State inspector of apiaries, M. E. Darby (*Missouri Bd. Agr. Mo. Bul., 6 (1908), No. 11, pp. 3–13, figs. 6*).—During the season of 1908, 340 apiaries and 5,155 colonies were inspected, of which 166 apiaries and 469 colonies were found diseased. A brief account is given of foul brood and other bee diseases.

The hive and honey bee, L. L. Langstroth, rev. by C. Dadant (*Hamilton, Ill., 1908, pp. X+575, pls. 28, figs. 229*).—A second revision of this work.

A guide to the culture of mulberry trees and to the commercial raising of silkworms, J. Bolle (*Anleitung zur Kultur des Maulbeerbaumes und zur Rationellen Aufzucht der Seidenraupe. Görz, 1908, pp. VII+107, pls. 2, figs. 112*).—In part 1 the author considers the culture of mulberry trees, their enemies, diseases, etc. In part 2 a detailed account is given of the methods of rearing silkworms, nature and treatment of the diseases affecting them, etc.

Inheritance in silkworms, I, V. L. Kellogg (*Leland Stanford Jr. Univ. Pubs., Univ. Ser., 1908, No. 1, pp. 89, pls. 4, figs. 2*).—This is said to be a first contribution of data and results derived from a general study of silkworm inheritance.

FOODS—HUMAN NUTRITION.

On the presence of tin in certain canned foods (*Local Govt. Bd. [Gt. Brit.], Med. Dept., Rpts. Insp. Foods, 1908, No. 7, pp. 30*).—This document consists of two parts, namely, a report of investigations and a discussion.

General observations on the inquiry, by G. S. Buchanan (pp. 1–4).—The investigations reported in the following paper are briefly summarized and discussed.

On the presence of tin in certain canned foods, together with some investigations on the toxicology of tin, by S. B. Schryver (pp. 5–30).—The author reports the examination for tin of a large number of samples of canned goods, in many cases five to seven years old. A colorimetric and gravimetric method were used for the estimation of tin, the former depending upon the purple color reaction obtained by the use of dinitro-diphenylamine-sulphoxid with stannous chlorid in the presence of an excess of hydrochloric acid. Under the experimental conditions described 0.25 grain of tin per pound of sample gave a marked color.

The procedure in the gravimetric method employed was for the most part similar to that used for the colorimetric estimation. "The organic matter was destroyed by a mixture of potassium sulphate and sulphuric acid, and the tin precipitated from the diluted solution as sulphid. This was converted into oxid, which was weighed as such instead of being estimated colorimetrically."

As regards the results obtained, "the meat foods, as a class, appeared to have taken up into their substance a comparatively small proportion of tin, even after six years or more. Often the quantity of tin present in these meats has been less than 0.5 gr. per pound; in only one instance (canned tripe) did it reach 2 gr. per pound. Meat extracts of similar age, however, had absorbed a considerably greater proportion of tin, and the same in a less degree was the case with meat essences.

"Only one of the three samples of canned soup of 6 to 8 years old contained tin in large quantities; in this instance the soup no doubt contained fruit acid derived from tomatoes. Canned lobster of 6 to 8 years of age had absorbed as much as 2.39 gr. of tin to the pound. . . .

"The two samples of canned vegetables (parsnips and carrots, 6 to 8 years) showed 1.5 and 2.19 gr. of tin per pound respectively. Canned jams and puddings containing fruit, of the same age, took up considerably more tin than the

meat foods; the apple and plum puddings and a sample of apricot jam contained about 3 grains of tin to the pound. No samples of the canned fruits most commonly consumed in this country (pears, apricots, pineapple, etc.) were included . . . [in the samples examined.] It was satisfactory to find that the highest amount of tin present in samples of canned pears, apricots, and peaches, obtained from a London importer, who specially selected them as old stock and stated them to be between 1 and 2 years old, was not more than 1.03 gr. per pound."

As the author notes, his investigations brought out a fact which he had observed before with meat extracts, namely, "that the tin after solution in the liquid contents of the can, becomes in course of time absorbed in or chemically combined with the solid contents (meat, fruit, etc.) in such a way that the latter contain relatively larger quantities than the liquid itself.

"Other examinations tended to emphasize the important part which may be played by unsatisfactory soldering in connection with high degrees of contamination; . . . It is evident that the presence of solder in the contents of the can may cause very pronounced solution of tin; no doubt owing to electrolytic action. It is possible that unsatisfactory tin plate (e. g., cans which have been so thinly coated on the interior that the underlying metal is at points practically exposed to the action of the contained liquid) may also tend to affect the extent of solution of tin by means of electrolytic action."

In pharmacological studies of which the author himself was the subject tin in the form of a double tartrate with sodium was taken during three weeks. Urine and feces were collected and examined.

"In the one experiment on a human being, the excretion of tin kept pace for a fortnight with the intake, when the latter did not exceed 2 gr. daily. With an increase of dose in the third week, there was some evidence of a cumulative action. . . . There was in all cases relatively small amount of absorption from the alimentary tract, as indicated by the small amounts of metal excreted in the urine. When tin enters the system by a channel other than the alimentary tract, the metal is excreted (at any rate in the case of dogs) in larger quantities in the urine than in the feces. . . .

The data presented . . . "do not indicate much probability of serious risk of chronic poisoning by the absorption of nonirritant compounds of tin as a result of a diet which consists largely of canned foods and is continued over considerable periods of time."

The work of other investigators is summarized and discussed in connection with the experimental data reported and a bibliography is appended to the paper.

The deterioration and commercial preservation of flesh foods. I, General introduction and experiments on frozen beef. W. D. Richardson and E. Schierbel (*Jour. Amer. Chem. Soc., 30 (1908), No. 10, pp. 1515–1564*).—The general subject of deterioration of meat is discussed and results of experiments reported on the physical and chemical changes which take place when meat is kept in cold storage.

The physical changes in frozen beef may be due to desiccation or to pressure produced by the expansion of water during the freezing process and particularly to the fact that water freezes outside the cell walls. Another physical effect in meat under conditions of storage lies in the contraction of the insoluble tissue elements which takes place even when the moisture remains constant. The temperature at which meat becomes solid depends upon phenomena connected with the lowering of the freezing point of water by the presence of soluble solids and similar constituents.

The evidence from both cultural and microscopic examinations of frozen beef led to the conclusion that bacteria are not capable of penetrating it in this con-

dition. In the chemical work on frozen meat it was the authors' purpose to show whether or not there was a progressive change in the constituents of the meat such as would result in an increase of its soluble constituents and ammoniacal nitrogen. The figures for fresh and frozen samples are very similar, and the variations did not tend definitely in one direction. The authors believe that whenever decomposition of meat occurs to any noticeable extent volatile basic substances are formed, increasing with the degree of decomposition, chief of which is NH_3 derived from NH_4 salts.

From their experiments they conclude that no decomposition is shown by the values obtained for ammonia nitrogen and hence that no bacterial decomposition occurred in the stored meat. Frozen beef stored 610 days was in their opinion not different in flavor from fresh beef. The general conclusion is reached that cold storage below — 9° is an adequate and satisfactory method for the preservation of beef for at least 554 days.

Refrigeration and the preservation of meat, U. Ferretti (*I Frigoriferi e la Conservazione delle Carni. Rome, [1908], pp. 26, figs. 21*).—This article contains a summary and discussion of refrigeration and cold storage with special reference to meat and the use of cold storage meat in the diet.

Food products at the First International Cold Storage Congress, H. Bouvier (*Rev. Sci. [Paris], 5. ser., 10 (1908), No. 26, pp. 804–808*).—A report of proceedings of the First International Cold Storage Congress, Paris, October, 1908, with special reference to the question of preservation of food.

The preserving of fruits, vegetables, and meat, Rosa Albert (*Das Konservieren von Obst, Gemüse und Fleisch. Hanover, 1907, pp. VIII+93, figs. 11*).—This is a second edition of a work on the preserving of foods and is based on the practical experience of the author.

The temperature attained in sterilizing preserved vegetables and fruits, J. Kochs and R. Weinhausen (*Ber. K. Gärt. Lehranst. Dahlem. 1906–7, pp. 146–161; Pure Products, 4 (1908), Nos. 11, pp. 517–522; 12, pp. 565–571*).—In confirmation of the work of other observers, it was noted that the diffusion of heat in sterilizing canned goods is dependent upon the manner in which the contents are packed. The more solidly the material is packed, and the less fluid in the can, the greater the difficulty with which the heat will penetrate. The results obtained are not regarded as definite enough for final deductions.

In tests with glass and earthenware jars satisfactory results were obtained. Since heating canned goods in a water bath does not make it certain that all of the micro-organisms are killed, the authors believe that fractionated sterilization is sometimes desirable. The great importance of cleanliness in canning is insisted upon.

The manufacture of preserved vegetables, J. Ott (*Die Fabrikation der Gemüsekonserven. Leipsic, 1909, pp. VIII+143, figs. 24*).—A general treatise on the canning of vegetables on a commercial scale.

Preserved fruits in Europe, H. L. Washington and R. P. Skinner (*Daily Cons. and Trade Rpts. [U. S.], 1909, Nos. 3399, pp. 1–4; 3414, pp. 1–8*).—These consular reports describe French methods of preparing candied fruits and chestnuts.

Canning and preserving, E. K. Ellsworth (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 389–429*).—Noted from another source (E. S. R., 19, p. 166).

Slaughtering and meat packing (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 457–491*).—Noted from another source (E. S. R., 20, p. 63).

The examination of sausage, E. Roth (*Schweiz. Wchnschr. Chem. u. Pharm., 47 (1909), No. 7, pp. 93–96*).—Analytical data are reported and discussed. The

author concludes that on the fat-free basis sausage should not contain more than 75 per cent water.

Spectroscopic properties of yolk of egg, L. Lewin, A. Miethe and E. Stenger (*Arch. Physiol. [Pflüger], 124 (1908), pp. 585–590; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 554, II, 1054*).—Attempts are being made to establish relationships between the coloring matters of egg yolk and blood on account of the close morphological relation of these materials. Spectroscopic analysis showed that the yellow coloring matter in the yolk gave characteristic bands and it is therefore concluded that it is possible to detect the adulteration of egg yolk by spectroscopic measurements.

The nutritive value and digestibility of raw and soft boiled hens' eggs, S. Aufrecht and F. Simon (*Deut. Med. Wchnschr., 34 (1908), No. 53, pp. 2308–2310*).—From the results of a single digestion experiment with a healthy man, in which raw and soft boiled eggs were eaten in comparison with meat as a part of a simple mixed diet, the authors conclude that the raw eggs have the higher digestibility and nutritive value.

Desiccated milk, W. M. Booth (*Spice Mill, 31 (1908), No. 10, pp. 620–623*).—A brief description is given of the method of manufacture of several sorts of commercial powdered milk goods and analytical data are summarized regarding the composition of such materials. As the author points out, powdered milks are made to contain varying amounts of fat by the removal of more or less cream before evaporation.

Notes on investigations on the nutritive value of plant amids, E. Schulze (*Ztschr. Physiol. Chem., 57 (1908), No. 1–2, pp. 67–73*).—A critical discussion of recently published work on this subject.

Starch, R. H. Merriam (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 381–388*).—Noted from another source (E. S. R., 20, p. 64).

On some vegetable fats native to Sarawak, J. Hewitt (*Agr. Bul. Straits and Fed. Malay States, 6 (1908), No. 5, pp. 173–175*).—A number of oil bearing seeds are described which are important sources of culinary fats used by Malays. Some information is also given regarding the character of the oils and methods of preparation.

Befri seed, W. H. Michael (*Mo. Cons. and Trade Rpts. [U. S.], 1908, No. 338, p. 125*).—Some information is given regarding the composition and use as food in India of the seed of a leguminous plant called befri (*Indigofera glandulosa*).

Sensitiveness to light of white animals fed buckwheat, W. Öhmke (*Zentbl. Physiol., 22 (1908), No. 22, pp. 685, 686*).—It has been observed that white or partially white animals fed buckwheat, when exposed to light, suffer from skin disease, and the author made experiments with small animals to obtain additional data on this subject. It was found that the skin affection followed eating either buckwheat grain or hull, but that the effects were not noted if the animals were kept in the dark. The alcoholic extract of buckwheat produced the same effects while the extracted grain did not do so. The alcoholic extract was fluorescent and the author suggests a possible connection between buckwheat disease, fagopyrismus, and this property, in line with results of other investigators. [This work is of interest in view of the widespread belief that eating buckwheat causes rash and other skin troubles.]

Pellagra, a précis, C. H. Lavinder (*Washington: Pub. Health and Mar. Hosp. Serv. U. S., 1908, pp. 22, pl. 1*).—This digest of data regarding the occurrence, symptoms, and treatment of pellagra, a disease most prevalent in northern and central Italy and in Roumania and commonly attributed to eating spoiled Indian corn, is of interest in connection with the preparation and use

of corn as food, especially since "there has appeared in the Southern States a disease which is possibly true pellagra. . . .

"The culture of maize in the United States has been practiced since before the discovery of America, and it has always been a staple article of diet over a large area of territory, yet, with the exception of a few sporadic cases in Mexico and Central America, the North American continent has been singularly free from the disease. This has been attributed by writers on pellagra to a climate well adapted to growing maize, and probably to better general hygienic conditions among the poorer rural classes."

As regards the prophylaxis treatment of the disease, "this may be summed up briefly—cease using spoiled maize as food. This seems simple enough, but in reality is often difficult of accomplishment for many obvious reasons. In individual cases it may often be easy, but to apply it to a large area of territory is another matter. The only apparent methods would seem to be: (1) Avoid alterations in maize and consequent feeding on a toxic substance; (2) replace maize with some other cereal and cease using all food and drink derived from maize [where the disease exists].

"Many and various attempts have been made in Italy to do the former by the establishment of drying ovens, economical kitchens, pellagrous hospitals, etc., but such efforts have not met with great success. As for the latter, at present the difficulties seem almost insuperable."

Corn oil in the treatment of pulmonary tuberculosis, J. Ritter (*Jour. Amer. Med. Assoc., 51 (1908), No. 1, pp. 39, 40*).—In this discussion of the use of corn oil in the treatment of tuberculosis the author presents data on its manufacture and general food value. In his opinion corn oil is an economical and useful food fat.

Aboriginal methods of preparing corn for food by the American Indians of Arizona and New Mexico, E. Krulish (*Dietet. and Hyg. Gaz., 25 (1909), No. 1, pp. 55–57*).—On the basis of personal knowledge the author discusses the methods followed in making corn bread and other corn food dishes and beverages.

Some useful maize dishes (*Natal Agr. Jour., 11 (1908), Nos. 10, pp. 1297–1303; 11, pp. 1446–1455*).—A collection of recipes for Indian corn dishes.

Rice, cleaning and polishing, H. McK. Fulgham (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 431–442*).—Noted from another source (E. S. R., 19, p. 166).

Flour and grist mill products, E. K. Ellsworth (*Bur. of the Census [U. S.], Manfrs. 1905, pt. 3, pp. 341–379*).—Noted from another source (E. S. R., 20, p. 64).

Milling of wheats, J. C. Brunnich (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1907–8, pp. 67, 72–77*).—As part of the work of the agricultural chemist milling tests of a large number of varieties of wheat were made and reported. The author notes that in the case of some of the flours gluten could not be obtained in the usual manner, by washing, as it crumbled into small pieces. This the author attributes to previous treatment of the flour with sulphur fumes.

Hungarian wheat and Hungarian flour, T. Kosutány (*Der Ungarische Weizen und das Ungarische Mehl. Budapest, 1907, pp. 356, figs. 60, map 1*).—An exhaustive summary and digest of data on Hungarian wheat and flour. The author subdivides his volume into three divisions, namely, (1) wheat from the standpoint of chemistry, plant physiology, physical and agricultural value, (2) flour, and (3) bread.

The theory and practice of testing flour, Cornelia Kennedy (*Pure Products, 5 (1909), No. 3, pp. 127–135*).—The author summarizes and describes the

methods of testing the quality of flour employed by millers, including determinations of moisture, ash, acids, total nitrogen and gliadin, baking tests, absorption and expansion tests, and determinations of wet and dry gluten.

"These are the principal tests, technical and chemical, generally used in testing flour. No single test has yet been found which can be used to the exclusion of other tests nor can any hard and fast rule be laid down as to what constitutes a flour of high baking qualities. By making these tests day in and day out records accumulate which are invaluable as guides in the testing and making of flour."

Defense of the bleaching of flour, B. S. Elliott (*Amer. Hay, Flour, and Feed Jour., 14 (1909), No. 2, pp. 27–29*).—A summary of data presented in a hearing before the Secretary of Agriculture, with reference to the legal status of flour bleaching.

Air bleaching of flour in the doughing state, C. Cristadoro (*Amer. Miller, 36 (1908), No. 8, pp. 619, 620*).—According to the author, white bread can be made from yellowish durum flours by so controlling the fermentation of the dough that the bread is thoroughly aerated.

Fungus and bacterial growth on stored flour, H. G. Bell (*Amer. Miller, 37 (1909), No. 4, pp. 280, 281, fig. 1*).—As the author points out, the chief destructive agencies in stored flour are fungi and bacteria. "The fungi or molds readily break down the starches of the flour, setting free organic acids and causing the flour to go sour. The bacterial forms, on the other hand, are all liquefying, or decomposing, in nature, and cause the rapid destruction of the flour."

In a comparison of patent flour and baker's flour of good grades stored under the same conditions a greater number of both bacteria and molds were found in the baker's flour than in the patent grade. "This is probably due to the finer separations made in the process of separating the high-grade flour. Without doubt, these molds and bacteria have much to do with the deterioration of flours in storage. Probably the molds cause the rapid increase in acid, which reacts upon the gluten of the flour. Some of the liquefying bacteria probably react upon this same element, the gluten of the flour, causing the value of the material stored to deteriorate very rapidly."

As protection against the growth of these low forms of life the author suggests storage in well-lighted rooms.

The water content of bread, O. Mezger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 7, pp. 395–397*).—Determinations of the water content of black bread and white bread are reported which were undertaken in a comparison of actual conditions with the food-law requirements. The results show, according to the author, that in many cases the crumb of freshly baked bread does not show the qualities which might be expected from a determination of its water content.

Concerning the potato content of bread, J. Tóth (*Chem. Ztg., 32 (1908), pp. 685, 686; abs. in Chem. Abs., 2 (1908), No. 20, p. 2831*).—No differences in protein content were noted in bread made from wheat, rye, a mixture of wheat and rye, and wheat and potato in equal parts. The potato bread, however, gave a smaller and moister loaf. The ash of the potato flour contained considerably less phosphoric acid than the wheat or rye flour.

Sophisticated zwieback, E. Glaser (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 8, pp. 469–473*).—One of the samples of zweiback described showed green patches due to the use of artificially colored caraway seeds and the other showed brown spots due to rancid oil from aniseed added to the dough. Suitable packages for marketing zweiback, and similar questions were discussed.

The iron and phosphorus content of vegetables, E. Haensel (*Biochem. Ztschr., 16 (1909), No. 1, pp. 9–19*).—Determinations of total ash, phosphoric acid, and iron oxid in a large number of samples of vegetables, fruits, and nuts are reported. In 3 sorts of edible fungi, peanuts, and Brazil nuts lecithin was determined and in the case of the fungi the nitrogen also.

In connection with this work the author studied the amount of iron removed in cooking spinach and lettuce. In one test with spinach 0.17 per cent iron oxid was found in the material extracted in cooking and 0.73 per cent in the material not dissolved. In the second test the values were 0.15 and 0.66 per cent. When lettuce was cooked in a similar way 0.35 per cent iron was found in the extracted material and 0.84 per cent in the insoluble portion in one test and 0.39 and 0.85 per cent, respectively, in the second test. As the author notes, these results show that all the iron contained in such foods is not utilized if the water in which they are cooked is thrown away.

Beans containing hydrocyanic acid, L. Guignard (*Rec. Actes Off. et Doc. Hyg. Pub., Trav. Cons. Sup. Hyg. Pub. France, 36 (1906), pp. 594–632*).—A summary of extended investigations of beans of different sorts.

The author concludes that all varieties of *Phascolus lunatus*, both wild and cultivated, contain the hydrocyanic acid compound and the ferment which liberates the hydrocyanic acid when the grain, crushed or ground, is mixed with water and the temperature is not great enough to destroy the ferment. In order that beans may be free from hydrocyanic acid it is essential that cooking be long continued.

In an appendix a method of determining hydrocyanic acid is proposed.

Canned vegetables containing copper, G. Graff (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 8, pp. 459–468*).—The author concludes that copper salts are not native bodies and that their use should be restricted. The article contains data regarding the extent of the greening of vegetables with copper salts in Germany and methods for detecting copper.

The rapid change in composition of certain tropical fruits during ripening, H. C. Prinsen Geerligs (*K. Akad. Wetensch. Amsterdam Proc. Sect. Sci., 11 (1908), pp. 74–84; abs. in Jour. Chem. Soc. [London], 94 (1908), No. 553, II, p. 977*).—Mangoes, bananas, tamarinds, and sapodillas, the fruits included in this investigation, are commonly gathered in an immature state; within a few days they become tender and palatable, and in a few days more they become overripe, soft, and unpalatable. Experiments with bananas showed that during the ripening process there is an evolution of carbon dioxid and water, and a considerable conversion of starch into sugar. Oxygen is necessary for the ripening process, and bananas will keep their starch intact if surrounded with an atmosphere of nitrogen. The author therefore considers that sugar production is a vital process, although he succeeded in showing the presence of an enzym capable of decomposing starch.

The results obtained with the mango were similar to those obtained with the banana. In the case of the sapodilla, however, the amount of sugar before and after ripening remains unaltered, and the change appears to be chiefly a softening of the hard pectin, and a deposition of tannin and gutta-percha from the juice as insoluble substances.

A sweetmeat from bananas, R. J. Totten (*Mo. Cons. and Trade Rpts. [U. S.], 1909, No. 341, p. 76*).—The author describes a method of making a crystallized fruit sweetmeat by drying bananas in sugar.

Sulphured fruit, H. Lührig (*Pharm. Zentralhalle, 49 (1908), No. 42, pp. 851–854*).—The author examined different portions of packages of sulphured fruits to determine whether the sulphur content was uniform, a matter of importance in the examination of such goods in connection with food inspection.

According to his results the middle portion contained more sulphur than either the upper or lower layer. It was also found that the length of time the goods were kept affected the quantity of the sulphur, much smaller amounts being found after storage for about 9 months.

[Wholesomeness of sulphured fruits], A. J. Atkins (*Cal. Fruit Grower, 39 (1909), No. 1073, pp. 3, 11, fig. 1*).—A popular description of a test in which a considerable quantity of sulphured fruit was included in the diet. From general considerations of weight and opinions of the subjects the author believes no harmful results were induced. Some determinations of the sulphurous acid in the cooked fruit are reported.

Vegetables and fruit as articles of diet and remedial agents, A. Brass (*Schr. Volksw. Ver. Obst u. Gemüseverwert. Deut., 1908, No. 3, pp. 14*).—A popular discussion of the subject.

Viscosity of cane-sugar molasses, H. C. Prinsen Geerligs (*Internat. Sugar Jour., 10 (1908), No. 120, pp. 584–592*).—The investigations reported and discussed led to the conclusion that concentration and temperature are the principal factors which determine the viscosity of molasses, and that the gum content, the presence of decomposition products of reducing sugar and other deposits, and the presence of fine grains of sugar, are secondary factors. Molasses which is satisfactory from the standpoint of viscosity may be obtained "by taking care not to drive the concentration of the last massecuites too far, or, in case they have become too much concentrated, to dilute them with dilute molasses in a judicious manner and this until the sugar-salt combination . . . has attained its own full-water content."

Maple sirup, A. Thurston (*Merck's Rpt., 18 (1909), No. 3, pp. 60, 61*).—The author reports results obtained in the examination of 33 samples of pure maple sirup and 3 samples of adulterated goods and outlines the methods followed.

The honey produced by sugar-fed bees, Neubauer (*Rheinische Bienenztg., 59 (1908), pp. 110–113; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 17 (1909), No. 1, p. 58*).—The author does not consider that such goods can properly be called honey.

Concerning rose apple jam, O. Mezger and K. Fuchs (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 7, pp. 390–395, figs. 4*).—A microscopical and chemical study of rose hips and jam made from them. This material is commonly homemade but has some commercial importance in Germany.

Ice cream, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 162, pp. 14*).—Of 80 samples of ice cream received in such condition that the fat content could be studied one-half contained over 14 per cent and one-half less than 14 per cent of this constituent. Of the last-mentioned group 12 samples contained less than 10 per cent fat. Gelatin was found in 73 of the samples examined and starch in 27. In some cases the starch was present in small quantities and "may be due to the freezing apparatus, or other container, having previously been used for a starch containing product."

Most of the samples were uncolored. Of those which were colored only two contained coal-tar dyes.

Composition of oriental foodstuffs: Bosa, halva, and locoum, N. Petkoff (*Ztschr. Öffentl. Chem., 14 (1908), No. 11, pp. 205–208*).—The first of these products is a nonalcoholic beverage and the remaining two a sort of confection. Analyses of a number of samples of each are reported.

Cider, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 169, pp. 19*).—The results of an examination of a large number of samples of cider are reported. Although the author considers some of them suspicious, he believes that more work is needed before a definite pronouncement can be made as to the specific character of cider and the extent of its variations.

Native wines, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 160, pp. 23*).—Analyses of a large number of samples of native wines are reported and discussed.

Swiss wine statistics (*Landw. Jahrb. Schweiz, 22 (1908), No. 11, pp. 601–623*).—A summary of statistics of the wine produced in Switzerland in 1907.

A study of certain genuine wines from the province of Florence, R. Salvadori and A. Mazzaron (*Gaz. Chim. Ital., 38 (1908), I, pp. 54–63, figs. 2*).—Analyses of 15 samples of red wine and 3 samples of white wine are included in this report.

Composition of Mâconnais-Beaujolais wine, G. Paturel (*Prog. Agr. et. Vit. (Ed. l'Est-Centre), 30 (1909), No. 5, pp. 147–153*).—Samples of 49 wines were analyzed.

Analyses of musts and wines from vines sprayed with arsenic compounds, A. Szameitat (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1907, pp. 176–179*).—The analyses in most cases showed only a slight trace of arsenic.

The occurrence of arsenic in German wines, A. Szameitat (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1907, pp. 180–185*).—Of 38 samples analyzed 24 showed small amounts of arsenic, the source of which was not identified.

Investigation of musts and wines from vines infested with Peronospora (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1907, pp. 191–204*).—The fermentation of the musts and composition of the wine were found to be entirely normal, and the conclusion is reached that the so-called peronospora taste noticeable in some wines must be due to faulty fermentation, incorrect cellar treatment, or some other similar cause.

Olive oil for protecting wine, U. Rossi-Ferrini (*Rivista, 4. ser., 14 (1908), No. 17, pp. 392–395*).—Spoiling of wine owing to the rancidity of olive oil floated on top to protect it is discussed.

Effects of coffee and objections to the use of chicory, R. Grimshaw (*Brit. Food Jour., 11 (1909), No. 121, p. 3*).—Data on the effects of coffee and chicory are summarized from which the following statements are quoted:

"The organic constituents of roasted chicory mainly consist of sugar, with caramel, inulin, and albumin. With the caramel there are also other organic coloring matters; and the tinctorial power being very great, this is a principal reason for the employment of chicory as an addition to coffee, very slight quantities thereof sufficing to make true coffee infusion appear very dark brown, hence apparently very strong. Digestion is more impeded by chicory than by coffee. The constant use of extract of chicory as a drink may cause injury to the system by reason of the great quantity of potash salts which it contains, and it exhibits no compensating advantages in the way of nourishment or stimulating and exhilarating effects on the system."

Concerning the quality of tea, C. Hartwich and P. A. Du Pasquier (*Apoth. Ztg., 24 (1909), No. 14, pp. 130, 131*).—A number of analyses are reported and discussed with reference to judging the quality of tea.

Concerning coco, K. Farnsteiner (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, pp. 625–647*).—A study of the effects of the different methods of treating coco to increase its solubility.

The microscopical examination of chocolate and powdered coco, E. Collin (*Ann. Chim. Analyt., 13 (1908), No. 12, pp. 471–478, fig. 1*).—With a view to facilitating the examination of coco and chocolate the author reports the results of a microscopical study of the histological elements of these materials.

Pepper adulterated with vetch seeds, Fleury (*Trav. Sci. Univ. Rennes, 6 (1907), pp. 140–142*).—A sample of unground black pepper examined was

found to contain 30 per cent of vetch seed treated with some solution which had given a spicy taste and caused a wrinkled appearance.

Ground pepper. A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 165, pp. 33*).—Of the 298 samples of pepper examined 216 were considered genuine, 13 doubtful, and 69 adulterated.

"It appears that the chief centers of adulteration of pepper are in and about Montreal, although Winnipeg is becoming too prominent in this regard."

Oil of lemon. A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 154, pp. 11*).—Analyses are reported of 45 samples of lemon oil collected in Canada. Definite conclusions are not drawn from the work.

Concerning canarium oil. K. Wedemeyer (*Seifensieder Ztg., 34 (1907), p. 26; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 17 (1909), No. 1, pp. 57, 58*).—A study of the physical and chemical characteristics of canarium or Java almond oil. This oil, as stated, is used as a high grade culinary fat and also as an adulterant for almond oil. When thus used it may be detected by means of its iodin number.

Concerning Liebig's meat extract. R. Engeland (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, pp. 658–664*).—The investigations reported were undertaken with a view to simplifying the technique of investigations reported earlier (E. S. R., 18, p. 563).

Are yeast extracts justifiable as substitutes for extract of meat? A. Gamgee (*Brit. Med. Jour., 1908, No. 2486, pp. 449–453*).—From a digest of data on the subject the author concludes that yeast extracts should not thus be used. The dietetic value of such materials is also considered.

Purin metabolism and yeast extracts (*Brit. Med. Jour., 1908, No. 2486, pp. 518–520*).—An editorial discussion of the question considered in the above article.

Food extracts made from yeast. A. C. Chapman (*Brit. Med. Jour., 1908, No. 2502, pp. 1741–1743*).—The author does not agree with the conclusions advanced by Gamgee, as noted above.

Diastase ferments. W. A. Puckner (*Jour. Amer. Med. Assoc., 51 (1908), No. 2, pp. 140–142*).—Results are reported which were obtained in the examination of the diastatic power of a number of samples of commercial diastase and recommendations made for the testing of such goods.

The factors and cost of board on Minnesota farms. T. P. Cooper (*Jour. Home Econ., 1 (1909), No. 1, pp. 43–51*).—Data regarding the cost of board on farms in selected regions in Minnesota are summarized and the factors which influence the cost of board are discussed. On an average the cost of farm board per man for the years 1905, 1906, and 1907 was $12.07 per month or 40 cts. per day. The average annual consumption of farm produce per man on a number of Minnesota farms was calculated.

[Standards of living of Mexican labor in the United States]. V. S. Clark (*Bur. Labor [U. S.] Bul. 78, pp. 466–522*).—This forms a part of an extended discussion of the general subject of Mexican labor in the United States and previously noted (E. S. R., 20, p. 991). Information regarding home life and standards of living is given, as well as general information regarding food and diet. According to the author, it is the general opinion that the Mexican immigrants have a better and more varied diet in the United States than at home.

French school cantines. L. Goldschmidt (*Daily Cons. and Trade Rpts. [U. S.], 1909, No. 3384, p. 13*).—A brief note on the dinners served to school children at Nantes, France.

The diet of the Chinese. Matignon (*Rev. Hyg. et Pol. Sanit., 31 (1909), No. 2, pp. 120–125*).—The food habits of the Chinese in North China are discussed, animal and vegetable foods described, and general data summarized.

Prices and wages in India (*Calcutta, India: Govt., 1908, pp. 226*).—A collection of statistics of wages and wholesale and retail prices of foodstuffs in India for periods of years up to 1907 or 1908.

Manual for the subsistence department, United States Army (*War Dept. [U. S.], Off. Com. Gen. Doc. 321, pp. 142, fig. 1*).—Subsistence stores, ration issues, subsistence property including kitchen cars, and other related subjects, are considered in this manual revised to September 1, 1908, and prepared under the direction of the Commissary-General of the U. S. Army.

U. S. Navy cookbook (*Annapolis, Md., 1908, pp. 62*).—Recipes and directions are given for the preparation of a large number of food materials in quantities sufficient for a mess of 100 men. The cookbook was prepared by the direction of the Bureau of Navigation at the School for Cooks and Bakers at the U. S. Naval Training Station, Newport, R. I.

The baking trade, G. Wolf (*Bäckerei. Hanover, 1907, pp. 147, figs. 71*).—A handbook designed for the instruction of bakers and students of milling and also for self-instruction. The three sections into which the book is divided include raw materials, bread, and bakery equipment, machines and ovens.

Plain cookery. Catharine A. Mulligan (*Winthrop Norm. and Indus. Col. S. C. Bul., 1 (1907), No. 1, pp. 54, figs. 7*).—Detailed directions are given for the preparation of vegetables, eggs, meats, poultry, and other foods, and some general principles of cookery are discussed.

Large meals for little money, Florence K. Johnson (*New York, 1909, pp. 36*).—This pamphlet is designed for use in university extension work, and in a series of twelve lessons gives directions for cooking simple dishes. Bills of fare for inexpensive meals and similar data are also included.

Treatise on food and nutrition under normal and pathological conditions, II, E. Maurel (*Traité de l'Alimentation et de la Nutrition à l'État Normal et Pathologique. Paris, 1908, pp. 680; rev. in Rev. Gén. Sci., 19 (1908), No. 14, p. 589*).—In this volume the author considers especially the rations suitable for growth, maintenance of the adult, food requirements in old age, and similar topics.

A system of diet and dietetics, G. A. Sutherland (*London, 1908, pp. 906; rev. in Brit. Med. Jour., 1909, No. 2513, Epit., pp. 537–539*).—This volume contains articles by different authors on a variety of topics concerned with diet in health and disease. Among others are a paper on the Evolution of Diet by H. Campbell, on the Physiology of Digestion by E. I. Spriggs, on Diet in Old Age by H. Campbell, and on Diet in Hot Climates by Sir P. Manson.

Criteria and standards in infant feeding, T. G. Allen (*Jour. Amer. Med. Assoc., 51 (1908), No. 20, pp. 1687–1691*).—The author discusses infant feeding in relation to protein and energy quotients and suggests that these values be used as a basis for determining infant diet.

Chemistry in its relation to food, J. F. Snell (*Jour. Soc. Chem. Indus., 28 (1909), No. 2, pp. 49–53, dgms. 2*).—The principal subjects included in this discussion are the determination of the relative value of foods, the elucidation of processes of digestion, the hygienic preservation of food, and the detection of adulterants.

The influence of feeding on the chemical composition of the animal body, L. B. Mendel (*Biochem. Ztschr., 11 (1908), No. 4, pp. 281–293*).—A summary of investigations carried on under the author's direction which have been previously published in full (E. S. R., 20, pp. 265, 266, 267).

The resorption of protein, K. von Körösy (*Ztschr. Physiol. Chem., 57, (1908), No. 3–4, pp. 267–287*).—The author's investigations, in his opinion, strongly substantiate the theory that resorbed protein becomes a part of the proteid material of the blood.

Further experiments on the utilization in the animal body of protein cleavage products, E. Abderhalden and J. Olinger (*Ztschr. Physiol. Chem., 57 (1908), No. 1–2, pp. 74–79*).—Meat protein cleavage products gave satisfactory results in feeding experiments with a dog. Casein cleavage products were not so satisfactory.

The behavior of carnitin in animal metabolism, R. Engeland (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 11, pp. 664–666*).—In experiments with dogs it was found that carnitin was completely broken down in the body. Some of the data reported indicate that carnitin may not be entirely harmless. Experiments with Herbivora (a rabbit) did not lead to conclusive results.

The digestibility of fat in the animal body, III, S. Levites (*Ztschr. Physiol. Chem., 57 (1908), No. 1–2, pp. 46–48*).—A note on the determination of glycerin in feces in connection with the author's work on the digestion of fat (E. S. R., 20, p. 663).

The functions of the liver in relation to the metabolism of fats, J. B. Leathes (*Lancet [London], 1909, I, No. 9, pp. 593–599*).—Results of the author's investigations and the work of other observers are summarized and discussed in this theoretical consideration of the metabolism of fat.

The author believes that "it is a fair hypothesis to make the starting point for work that the liver stands in a different relation to circulating fat [i. e., fat absorbed from the intestine and consigned into the systemic circulation] from the other organs of the body. Its work is to take up this fat and bring about certain changes in it [designated desaturation of the acids], the result of which is to make this material available for the use of the organs in which its potential energy is required." Reasons are given for the belief that the change referred to is at any rate in part a desaturation of the fatty acids.

"There is another difference between what may be called organized fat—the fat, that is, in the cells of the heart, muscles, kidneys, etc.—and the unorganized merely stored fat of the adipose tissue. The latter is the unaltered fat of the individual's food; it has its iodin value determined by that of the fat which has been absorbed, but it also contains no phosphorus. The fat in the liver and the other organs of the body, the organized fat, is very largely composed of phosphatid lipoid substances. Of these we know more or less dimly of a considerable number, more or less definitely, of one lecithin. . . . It has also been repeatedly noted that the fatty acids which can be obtained by saponification of lecithin or other phosphatid lipoid substances are more unsaturated than those from adipose tissue.

"It may therefore be that the work of the liver consists in the conversion of food fat into organized fat and that the desaturation of fatty acids is a change which occurs after that conversion has taken place; a change that is, therefore, removed from our ken so long as our knowledge of the nature and constitution of these lipoid molecules is as meagre as it is at present."

The probable importance of octohydroxy-arachidic acid in the metabolism of fat is discussed.

A preliminary note on the examination of fat in the liver in health and disease, E. L. Kennaway and J. B. Leathes (*Lancet [London], 1909, I, No. 2, pp. 95–98*).—Pig, goat, dog, and human liver were included in this study of liver fat.

Animal fat and the petroleum ether extract of the liver, Y. Nukada (*Biochem. Ztschr., 14 (1908), No. 5–6, pp. 419–429*).—According to the author about 0.4 to 0.7 per cent of the fat of flesh consists of a mixture of the lower water soluble and volatile fatty acids. The amount increases with the length of time the fat is kept. Such fat when fresh contains only small amounts of material

with free hydroxyl groups. On storage the amount of such material increases. On saponification, such fat and liver extract both yield cholesterin, the yield from liver fat being considerably the greater.

The behavior of certain indigestible carbohydrates in the digestive tract, L. B. MENDEL (*Zentbl. Gesam. Physiol. u. Path. Stoffwechsels, n. ser., 3 (1908), No. 17, pp. 641–654*).—A digest of data on insoluble carbohydrates, particularly those of marine algæ, and a summary of digestion experiments carried on in the author's laboratory with such foods in comparison with raw Italian chestnuts. See also a previous note (E. S. R., 18, p. 1068).

The possible advantage of these algæ carbohydrates as laxatives and other questions are considered.

An improved respiration apparatus of the Regnault and Reiset type, N. ZUNTZ and C. OPPENHEIMER (*Biochem. Ztschr., 14 (1908), No. 5–6, pp. 361–368, pl. 1*).—The respiration apparatus described is so arranged that it is immersed in water during experimental periods. The authors claim greater convenience of operation and the elimination of parts which are easily broken. With this form of apparatus it is not necessary to use mercury, and this also is considered an advantage.

Adjusting and testing the modified Regnault and Reiset respiration apparatus devised by Zuntz and Oppenheimer, A. SCHLOSSMANN and H. MURSCHHAUSER (*Biochem. Ztschr., 14 (1908), No. 5–6, pp. 369–384, figs. 3*).—According to the results of check experiments in which alcohol was burned in the respiration chamber the instrument gives very accurate results. Similar accuracy was obtained in an experiment with a dog which is also recorded.

Respiratory exchange of an infant as shown by experiments with the Zuntz and Oppenheimer respiration apparatus, A. SCHLOSSMANN, C. OPPENHEIMER, and H. MURSCHHAUSER (*Biochem. Ztschr., 14 (1908), No. 5–6, pp. 385–406*).—Using the respiration apparatus described above, experiments with a nursing infant are reported. Considering the average of six 8-hour periods, the oxygen consumption was 0.731 gm. per kilogram of body weight and the carbon dioxid production 0.913 gm., and the respiratory quotient 0.911. The average weight of the child was 5.79 kg. Determinations are also reported with infants asleep for different periods after feeding.

The transformation of energy in the muscles when work is performed, M. F. MAIGNON (*Ann. Soc. Agr. Sci. et. Indus. Lyon, 1907, pp. 145–161*).—A mathematical discussion of food energetics.

The effects of muscular work upon the excretion of endogenous purins, E. L. KENNAWAY (*Jour. Physiol., 38 (1908), No. 1, pp. 1–25*).—Quotations from the author's summary of his extended investigations follow:

"During unaccustomed muscular exercise, the output of uric acid is diminished, while that of the purin bases is increased; the total output of purin compounds does not differ greatly from the normal amount. Such exercise is followed by a greatly increased excretion of uric acid.

"If a certain amount of a certain form of work be performed on a series of occasions, the changes observed show a progressive diminution in amount. . . .

"Salicylic acid and muscular work can produce their characteristic effects upon the output of uric acid simultaneously without any apparent modification, and the amount excreted under these conditions is extremely large. These facts are most readily explained by supposing that muscular work leads to an increased formation of uric acid.

"The increase of purin bases and decrease of uric acid in the urine during muscular work appear to be due to defective oxidation of purin compounds. It was not found possible to produce evidence of a definite increase in these oxidative processes by inhalation of oxygen.

"The total amount of purin compounds excreted is a more constant quantity, both from day to day and at periods separated by intervals of months, than is the output of uric acid.

"The output of purin bases exhibits variations, corresponding to different portions of the day, which are very similar to those exhibited by the uric acid output.

"The amount of uric acid excreted tends to vary inversely, and that of the purin bases to vary directly, with the volume of urine."

Principles of general metabolism of matter and energy, II, O. KRUMMACHER (*Ergeb. Physiol., 7 (1908), pp. 444–446*).—A critical summary and digest of data on the metabolism of matter and energy.

International catalogue of scientific literature. Q—Physiology (*Internat. Cat. Sci. Lit., 6 (1909), pt. 1, pp. VIII+832; 6 (1908), pt. 2, pp. 936*).—The bibliography of physiology, including experimental psychology, pharmacology, and experimental pathology, previously noted (E. S. R., 19, p. 463), is continued in this volume, which contains material received between May, 1906, and August, 1907. Part 1 is the author catalogue and part 2 the subject catalogue.

ANIMAL PRODUCTION.

Reports to the evolution committee, W. BATESON ET AL. (*Rpts. to Evolution Com. Roy. Soc. [London], 1908, No. 4, pp. 60, figs. 3*).—This report is in continuance of previous work on the physiology of heredity. Investigations on poultry and sweet peas are reported by W. Bateson and R. C. Punnett, and on stocks by Miss E. R. Saunders and H. B. Killby; a preliminary account of the inheritance of coat color in mice by Miss F. M. Durham; on sex inheritance in the moth *Abraxas grossulariata* and its variety, *A. grossulariata* var. *lacticolor* by L. Doncaster; a note on the inheritance of sex in canaries by Miss Durham and Miss D. C. E. Marryat; and a corrigenda to report 3 on the factors which produce hoariness.

The work reported on poultry deals chiefly with the factors which influence the inheritance of (a) comb structure, and (b) white plumage. The study of comb inheritance has involved over 12,500 birds, and the results of this and previous work are presented in tabular form. "The rose comb is in reality a single comb modified by the presence of a 'rose' factor. The omission of this factor enables the single comb to appear. The same considerations apply to the pea comb, which is single plus a pea factor. The true allelomorphic pair in each case is the presence of a given factor which is dominant to the absence of that factor. . . . As the acceptance of the 'presence and absence' hypothesis seems to demand some general expression for such interrelation between factors belonging to distinct allelomorphic pairs, we propose the terms 'epistatic' and 'hypostatic.' For example, the combless, the single-combed, and the rose-comed conditions may, in the light of our present knowledge, be regarded as forming a cumulative series and we should speak of the factor for single as being dominant to the combless condition but hypostatic to the rose factor, and similarly the rose factor may be referred to as epistatic to the single."

A walnut comb is one in which both the rose factor and the pea factor are present, and such a comb may be either homozygous or heterozygous for one or both of these factors.

In the studies of white plumage there are two distinct classes of white fowl: (a) Those in which white is dominant to color, and (b) those in which white is recessive to color. The recessive whites are of at least three kinds, namely, the white birds which have arisen in the course of these experiments, the white of the silky fowl, and the white of the rose-comb bantams.

The results of the experiments in sex inheritance with canaries and the moth *A. grossulariata* are closely parallel, the females considered to be heterozygous in sex, femaleness being deemed dominant, and the male as homozygous in the absence of femaleness. The black-eye character of canaries is a dominant and the pink-eye character a recessive. "Whatever may be the truth regarding the transmission of sex, there is no escape from the remarkable conclusion that just as the normal females of the moth *A. grossulariata* are in reality hybrids in the lacticolor character, so the ordinary black-eyed hen canaries are hybrids in the pink-eye character."

The heredity of sex, R. C. PUNNETT and W. BATESON (*Science, n. ser., 27 (1908), No. 698, pp. 785–787*).—In this article Mendelian theories of sex are discussed. The authors believe that the sex determinants behave as Mendelian allelomorphs, females being dominant, that female individuals are heterozygous in respect to sex, and males homozygous, and that at least in some cases when two dominant factors coexist there is a repulsion between them such that each gamete takes one or other of these two factors, not both.

Secondary sexual characters, R. MÜLLER (*Das Problem der Sekundären Geschlechtsmerkmale und die Tierzucht. Stuttgart. 1908. pp. 89*).—This is an expansion of two lectures, in which the differences between the sexes in animals are discussed.

Recessive characters, C. B. DAVENPORT (*Science, n. ser., 28 (1908), No. 725, p. 729*).—A cow without a trace of body hairs gave birth to a calf with the ordinary hairy coat. "This result indicates that the presence of the hairy follicles is dominant over their absence. This adds another case to the law that the presence of a quality is dominant over its absence or that a retrogressive or retarded condition is recessive to the more developed conditions."

Degeneration, albinism, and inbreeding, C. B. DAVENPORT (*Science, n. ser., 28 (1908), No. 718, pp. 454, 455*).—The author enunciates certain principles which aid in understanding the reason for the degeneration which sometimes follows the practice of inbreeding. "When the two parents have any organ or quality A in two conditions, A+ and A—, of which the former is a highly developed or progressive condition, the latter a poorly developed or even absent condition, the former condition will regularly dominate over the latter. . . . When both parents have an organ in a low condition of development it will be so also in all of their children. This principle explains the persisting or increasing degeneration in the descendants of two degenerate parents."

Another class of degeneration is albinism, which is not a sport but a necessary, predictable result of certain combinations of gametes. "The only part that inbreeding plays is to make more probable the necessary combination of gametes. The degeneration in this case follows from the union of two negative factors in dihybrids, and this is a common cause of degeneration."

Breeding experiments with rats, T. H. MORGAN (*Amer. Nat., 43 (1909), No. 507, pp. 182–185*).—This is a report of some experiments in crossing rats to determine how far the Mendelian lines of discontinuous inheritance apply to wild varieties and species. In crosses of the black rat with the gray roof rat black is dominant to gray, whichever way the cross is made. All attempts thus far to cross the black rat or the roof rat with the Norway rat have failed.

The chondriosomes as bearers of the hereditary qualities, F. MEVES (*Arch. Mikros. Anat. u. Entwicklungsgeschichte, 72 (1908), No. 4, pp. 816–867, pls. 4; abs. in Amer. Nat., 43 (1909), No. 507, pp. 190–192*).—The author finds a large number of independent structures in the cytoplasm of the chick embryo at about the third day of incubation, which he calls "chondriosomes." He thinks that

these are the bearers of the hereditary qualities of the cytoplasm as chromosomes are the bearers of the hereditary qualities of the nucleus.

The inheritance of hyperdactylism in poultry, D. Barfurth (*Arch. Entwickl. Mech. Organ., 26 (1908), No. 4, pp. 631–649*).—Seven hyperdactyl Orpington hens were mated to a normal male of the same breed. Of 152 chickens which resulted 80, or 52.6 per cent, had the normal number of toes. Instances of hyperdactylism noted by other observers are cited.

Spurious allelomorphism [in poultry], W. J. Spillman (*Amer. Nat., 42 (1908), No. 501, pp. 610–615*).—Black Langshan males were mated with Barred Plymouth Rock females. In the progeny, all the females were black and all the males barred. The author also calls attention to several cases reported by other observers.

Yearbook of scientific and practical animal breeding, R. Müller (*Jahrb. Wiss. u. Prakt. Tierzucht, 3 (1908), pp. LLIV+227*).—The larger part of this report is occupied with critical reviews of literature relating to the anatomy, physiology, psychology, biology, geographical distribution, hygiene, feeding, breeding, and the history of domesticated breeds. There are original articles on the acclimatization of domesticated animals, a mutation in the Fjell breed of cattle, the "polled" character of cattle, and the influences that affect the length of the pregnant period of domesticated animals. From data collected on the last-named subject, P. Sabatini concludes that in horses, cattle, and sheep the length of pregnancy is shorter with twins, with the first born, with a female fetus, and in the early maturing breeds than with single births, males, the second or later births, or in the late-maturing breeds. These results do not appear to hold true in the case of swine.

The principles of animal nutrition, H. P. Armsby (*New York, 1908, 3. ed. rev., pp. VII+614*).—This is the third revised edition of this work (E. S. R., 14, p. 896).

The rate of growth of the egg yolk in the chick, and the significance of white and yellow yolk in the ova of vertebrates, O. Riddle (*Science, n. ser., 27 (1908), No. 703, p. 945*).—The author has employed a method discovered by Daddi in 1896, by which the rate of growth of the egg yolk of the chick may be easily measured. "If the fat stain Sudan III be fed to laying hens at intervals of one, two, or more days, the stain can be found later in the form of concentric red rings in all of the rapidly growing ova. The actual rate of growth varies widely from 0 to 2 mm., but one day of growth normally includes a layer of white yolk and a layer of yellow yolk. It is probable that the layer of white yolk represents the part which is grown during the later hours of the night, and that the yellow yolk is yolk of more rapid growth produced during the remainder of the day."

Sudan III deposited on the egg and transmitted to the chick, S. H. and Susanna P. Gage (*Science, n. ser., 28 (1908), No. 719, pp. 494, 495*).—The authors repeated the experiments of Riddle (noted above) and summarize the work on the subject as follows:

"The specific fat stain, Sudan III, colors the fat laid down in the living hen and in the fatty portions of the yolk while the feeding experiments are in progress, and thus serves to give exact data concerning the time and amount of deposit.

"The eggs so colored hatch, and the chick utilizing the yolk as food produces fat in its own body colored as in the adult, showing in the most striking manner the transmission of a specific and unusual or foreign substance from the mother to the egg, and from the egg to the offspring, and thereby marking the transmission of the actual substance of the egg, and indirectly of the mother, to the offspring.

"The precision of the method and its striking results apparently open to biologists a field which has lain dormant since its discovery by Daddi 12 years ago, that is, the possibility of following with great exactness at least one of the processes of nutrition."

Comparative investigations on the effect of proteid and nonproteid nitrogen on (the) gain in weight of ruminants, J. Just (*Landw. Vers. Stat., 69 (1908), No. 5–6, pp. 393–460*).—For these experiments 7 months old lambs were fed a basal ration low in protein, which consisted of meadow hay, starch meal, and sugar. For supplementary rations gluten meal was alternated with molasses chips, malt sprout extract, potato chips, and grass extract.

There was but little difference between the protein digestion coefficient of the supplementary feeds, except that with potato flakes it was somewhat lower and with grass extract it was considerably lower than with the other feeds. In general the results of these experiments agreed with those of Friedlaender (E. S. R., 20, p. 70) that amids are not of equal value with true protein.

On the influence of food fat on the body fat of swine, with special reference to the final location of phytosterin, J. König and J. Schluckebier (*Ztschr. Untersuch. Nahr. u. Genussmtl., 15 (1908), No. 11, pp. 641–661; abs. in Chem. Zentbl., 1908, II, No. 5, p. 427*).—From their original investigations the authors found that fat in cotton-seed meal and sesame meal was well utilized by young animals. The nonsaponifiable fats may be resorbed as body fats. Coloring matters in cotton-seed meal and sesame meal may be detected in the body fat of swine, though when fed to cows they could not be detected in milk fat. The body fats seem to retain the same chemical and physical properties that they have in the feed. As animals grow older the melting point of the body fat is raised and the corresponding iodin number falls. Leaf fat has a high melting point and a low iodin number. Phytosterin and cholesterin appear partially as koprosterin in the feces, though a part is unchanged. Relatively more nonsaponifiable fat is found in the feces than is contained in the food fat. After a long feeding with plant fats only cholesterin appears in the body in organic fats. Organs like the brain and liver though rich in cholesterin are not rich in phytosterin.

These experiments confirm the results of other investigators (E. S. R., 16, p. 18) that the phytosterin and phytosterin-acetate test of Bömer is a reliable method of detecting plant fats in animal fats.

Daily rations approximately balanced for different animals per 1,000 lbs. live weight, W. H. Dalrymple (*Ann. Rpt. Agr. and Indus. Statis. Bd. Agr. and Immigr. [La.], 1908, pp. 5–8*).—This presents sample rations for horses, mules, oxen, and dairy cattle, in which cotton-seed meal, molasses, and other by-products can be utilized.

Commercial feeding stuffs of Pennsylvania in 1907, F. D. Fuller (*Penn. Dept. Agr. Bul. 167, pp. 7–97*).—This is the annual report of the chemical and microscopical work performed by the division of chemistry in the examination of commercial feeding stuffs, and contains descriptions, analyses, and the comparative cost of feeds.

"Of the 560 samples collected, 498 were examined chemically and microscopically. Fifty-eight samples contained less protein than guaranteed by the manufacturers, and 37 samples were deficient in fat. . . . Practically all of the molasses feeds found upon the market contained a large proportion of weed seeds, and many of them were adulterated with rice hulls. Money which was formerly spent in purchasing low grade oat feeds is apparently being put into feeding stuffs of standard quality, and, therefore, we do not find as much oat feed in Pennsylvania as in former years." The most serious adulteration was

the use of ground rice hulls, which are useless as a feed, to adulterate molasses grains and other dairy feeds. "The poor quality of cotton-seed meal was due largely to weather conditions through the growing season, making it more difficult for mills to separate the hulls from the seed."

Analyses were also made of linseed meal, distillers' grains, brewers' grains, malt sprouts, gluten feed, wheat flour, bran and middlings, mixed feeds, animal by-products, and proprietary feeds of various kinds.

The artificial drying of moist feeding stuffs and their agricultural significance, D. MEYER (*Die Künstliche Trocknung der Wasserreichen Futtermittel. Hanover, 1908, pp. VI+130, figs. 26, dgms. 2*).—This work describes methods and apparatus used in drying beet chips, turnip tops, potatoes, brewers' grains, and distillers' slops. The nutritive value of these feeding stuffs for different kinds of live stock is also briefly treated in a popular manner.

Corn grits and corn meal as brewing adjuncts, J. L. WILLS (*Brewers' Jour., 33 (1908), No. 2, pp. 51–55, figs. 3*).—The author discusses the adaptability of the corn kernel to replace rice as a starch adjunct. Only No. 2 white corn with degerminated kernel can be used for this purpose. The finished product consists of hard white, angular fragments known as corn grits, and approaches rice in composition.

The composition of brewers' and distillers' grains, T. W. FAGAN and C. ALLAN (*Edinb. and East of Scot. Col. Agr. Bul. 16, pp. 21*).—The percentage of fat and nitrogeneous matter was found to vary to only a slightly greater extent in distillers' grains than in brewers' grains. "As far as the chemical analyses of the two grains is concerned there does not seem to be the difference in composition that would be expected when the prices of the two feeding stuffs are taken into consideration."

The nutritive value of grape marc, J. FABRE (*Ann. École Nat. Agr. Montpellier, n. scr., 8 (1909), No. 3, pp. 219–228*).—This is a report of analyses and of digestion coefficients of grape marc. The percentage of digestibility in horses was found to be as follows: Dry matter 28.5, protein 21.5, fat 50.4, nitrogen-free extract 34.5, fiber 20.3, and ash 29.0. In sheep the digestion coefficients were for dry matter 33.6, protein 15.9, fat 49.3, nitrogen-free extract 36.9, fiber 26.4, and ash 50.1 per cent.

The occurrence of cyanogenetic glucosids in feeding stuffs, T. A. HENRY and S. J. M. AULD (*Jour. Soc. Chem. Indus., 27 (1908), No. 9, pp. 428–433, dgm. 1*).—It has been previously noted that a number of plants used for feeding stuffs contain cyanogenetic glucosids and a glucosidolytic enzym. When these two products are brought into contact by placing them in water hydrocyanic acid is produced as a result of the decomposition of the glucosid. The author describes a method for determining the hydrocyanic-acid content and discusses the possibility of poisoning stock by feeding plants in which hydrocyanic acid is liable to be produced. If the enzyms in the plant are destroyed by heating there is less danger of poisoning.

Farm stock, C. W. BURKETT (*New York, 1909, pp. IX+358, pl. 1, figs. 113*).—This is a practical treatise on horses, cattle, sheep, and swine, including their breeding, feeding, care, and management in health and disease. "It is an everyday handbook of live stock and contains the best ideas gathered from the various authorities and the experience of a score of practical men in all departments of live-stock production."

The meat industry in Hungary, L. M. DOUGLAS (*Meat Trades' Jour., 28 (1908), No. 1072, pp. 564, 565, figs. 3; Vet. Jour., 64 (1908), No. 402, pp. 595–599, pls. 3*).—The information contained in this brief popular account of animal production and dairying in Hungary was obtained from a personal visit.

Horse breeding is a great industry and over $5,000,000 worth of horses are exported annually. Native Hungarian cattle constitute about 22 per cent of the total number of cattle, the rest being mainly breeds imported from Switzerland. Until recently but little attention had been paid to butter making, and hog fat is used largely to take the place of butter. The number of swine in the country is about 5,000,000. These for the most part consist of the Mangalicza breed, a coarse, long-haired beast with about 5 in. of fat along the back. Recently Yorkshires have been introduced. The system of meat inspection is very complete and up-to-date abattoirs exist throughout the country.

Cattle raising, F. Dettweiler (*Die Aufsucht des Rindes. Berlin, 1908, pp. 235*).—This is a treatise for the practical breeder. There are brief accounts of the origin of domesticated cattle and of the factors which influence inheritance. The main part of the book is devoted to the care and management of the growing animal. In an appendix of 61 pages data are given as to the cost of raising young stock of the different breeds.

The history of cattle breeding at Einsiedeln, P. O. Ringholz (*Landw. Jahrb. Schweiz, 22 (1908), No. 8, pp. 413–508, pls. 4, figs. 2*).—A contribution to the history of the Brown Swiss cattle from the ninth century to the present time. It contains much general information on the agriculture of Switzerland of the period, as well as an account of the improvement and importance of the Brown Swiss breed.

The spotted cattle of southern Moravia, M. Nitsche (*Österr. Molk. Ztg., 16 (1909), Nos. 1, pp. 1–3; 2, pp. 17–19; 3, pp. 31–33; 4, pp. 45–47*).—This is an abstract of a work by L. Adametz on the spotted cattle of this region. The variations in color, conformation, and economic qualities of these cattle are described. The methods of feeding are also noted.

Aberdeen-Angus cattle, A. Pulling (*London, 1908, pp. 150*).—This contains an account of the leading families of this breed, with a few notes as to why certain families have become fashionable.

On the protein minimum for growing wethers, T. Katayama (*Landw. Vers. Stat., 69 (1908), No. 5–6, pp. 321–341*).—From digestion experiments with 4-year-old wethers, the author concludes that leaving out of consideration the growth of wool, 0.41 kg. per 1,000 kg. live weight is the minimum protein requirement for wethers. The rations in these experiments consisted of hay, straw, sugar, starch, and aleuronat.

Fertility in Scottish sheep, F. H. A. Marshall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 20 (1908), pp. 139–151*).—From a study of data collected from the lambing returns of 1905, 1906, and 1907 it appears that some form of flushing or extra feeding immediately preceding the lambing period increases the percentage of fertility.

Unique experiment in sheep breeding, J. B. Spencer (*Farmer's Advocate, 43 (1908), No. 846, p. 1883*).—Selection experiments made by A. G. Bell to ascertain whether extra nipples could be so developed as to become functional, and whether sheep with four functional nipples were more prolific than other sheep, are reported. In the original flock those that bore twins constituted 24 per cent of the normally nippled and 43 per cent of the abnormally nippled ewes. After several years of selection most of the ewes born possessed four functional mammæ, and some had from 5 to 8 nipples. The multi-nippled sheep have not proved to be more fertile than the others. Twin lambs though smaller at birth often overtake single lambs by autumn.

Caracul sheep, A. Pirocchi (*Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 7 (1908), IV, No. 4, pp. 407–420*).—In this article the author describes the characteristics of these sheep and their geographical distribution. He thinks

that they should be imported to Italy for experimentation in acclimatization and crossing.

Origin of the Australian Merino (*Queensland Country Life, Spec. No., 1908, Dec., pp. 17, 18*).—This outlines the history of Merino sheep in Australia since their first introduction into that country in 1787.

Australian sheep, J. P. Bray (*Daily Cons. and Trade Rpts. [U. S.], 1909, No. 3401, pp. 5, 6*).—This is a statistical review of the sheep industry of Australia by the consul-general at Sydney.

Steamed v. dried potatoes as a feed for swine, M. Schmoeger (*Landw. Vers. Stat., 69 (1908), No. 5–6, pp. 359–391*).—In these experiments with swine the basal ration consisted of split peas, fish meal, and skim milk. When steamed potatoes were added to the basal ration the daily gain was 0.584 kg. (about 1.28 lbs.) per head, at a cost of 0.5267 mark per kilogram (about 5.7 cts. per pound). With potato flakes as a supplement the corresponding gain was 0.563 kg., at a cost of 0.547 mark per kilogram; with softened potato chips 0.519 kg., at a cost of 0.594 mark; and with steamed potato chips 0.647 kg., at a cost of 0.5778 mark.

The horse in history, B. Tozer (*London, 1908, pp. XX+304, pls. 25*).—This book traces "the progress of the horse from very early times down to the present day, mainly from the standpoint of the effect its development had upon the advancement of the human race."

Army remounts, M. A. O'Callaghan (*Agr. Gaz. N. S. Wales, 20 (1909), No. 2, pp. 99–110, figs. 15*).—Descriptions of types of horses required for remounts in the English army.

Age of trotting horse sires, F. R. Marshall (*Amer. Nat., 43 (1909), No. 505, pp. 50–53*).—The author discusses Redfield's dynamic theory of development, and takes the view that as the average age of sires of 2.10 trotting horses is about the same as that of the first thousand in the index digest, the records reveal no superiority of the old sire over the younger one.

Southern poultry guide or forty years with poultry, C. Husselman (*Richmond, Va., 1908, pp. 119, pl. 1, figs. 20*).—This is a practical treatise on the care and management of poultry, which is written more particularly for the people of the South who are engaged in this industry.

Poultry and eggs for market and export, D. D. Hyde (*New Zeal. Dept. Agr. [Pamphlet], 1908, pp. 51, pls. 8, figs. 28*).—This pamphlet is intended as a handy guide to practical methods of poultry keeping in New Zealand.

Poultry and eggs, F. R. Mowrer and R. P. Skinner (*Daily Cons. and Trade Rpts. [U. S.], 1909, No. 3400, pp. 8–12*).—The consul-general at Copenhagen reports that the growing demands of British markets have stimulated poultry raising in Denmark. Danish eggs to the value of $8,800,000 are annually consumed in England.

The consul-general at Hamburg reports that Germany imports about 3,500,000,000 eggs, principally from Russia, Asia Minor, and Egypt, and thinks that America could participate in this trade. Methods of preparing eggs for export are described.

The Buff Orpington duck, A. G. Goodacre (*Rel. Poultry Jour., 16 (1909), No. 1, pp. 12, 75, fig. 1*).—This article describes the characteristics of a new breed of ducks which originated in England a few years ago.

The care and breeding of rabbits, P. Mahlich (*Kaninchenzucht und Kaninchenhaltung. Hanover, 1908, pp. 68, figs. 11*).—This book contains brief descriptions of the different breeds of rabbits, with notes on their feeding, care, and management.

DAIRY FARMING—DAIRYING—AGROTECHNY.

Investigations on the influence of feed on the milk secretion of cows, A. BUSCHMANN (*Landw. Jahrb., 37 (1908), No. 6, pp. 899–959*).—This is a series of studies on the effect of feeding sunflower cake, coconut cake, wheat bran, and cotton-seed cake on the yield of milk and the characteristics of butter fat.

In the first experiment, with 18 cows, when coconut cake was replaced by sunflower cake the quantity of milk and the percentage of fat decreased, the saponification number of the butter fat was lowered, and the iodin number raised. In another experiment 4 cows were fed for three periods. In the first period while sunflower cake was the supplementary feed the percentage of fat in the milk was 3.01. In the second period when sunflower cake was replaced by coconut cake the percentage of fat was 3.13. In the third period the ration was the same as in the first and the fat decreased to 3 per cent.

In another experiment with three groups of 7 cows, when sunflower cake was replaced by coconut cake the yield of milk and the percentage of fat increased. When replaced by wheat bran there was a decrease in quantity and quality of milk. When cotton-seed cake was substituted for sunflower cake there was a correlation between the saponification and iodin values of the feed and of the butter fat, but no correlation of melting points. Nine out of 10 cows showed an increase in the quality of the milk when cotton seed was substituted for sunflower cake. Compared with coconut cake the cotton seed decreased the yield of milk but increased the percentage of fat.

A further study was made of the effect of feed on the properties of butter fat. When the cotton seed replaced sunflower cake the Reichert-Meissl number, saponification number, and melting point were raised, but the iodin number was lowered. The author concludes that a part of the fat of the food must be absorbed as such, but that the fat of the milk is affected by influences yet unknown. The quality of the butter apparently depends more upon the character of the food than on the amount of volatile fatty acids that it contains.

The protein requirement for milch cows, P. DERWA (*Rev. Gén. Agron., n. ser., 3 (1908), No. 11, pp. 455–458*).—From experiments in feeding 8 cows on rations containing different amounts of protein, the author concludes that a ration should contain 1 gm. of digestible protein for each kilogram of live weight plus 50 gm. for each liter of milk produced.

A local cow census (*Hoard's Dairyman, 40 (1909), No. 5, pp. 146, 147*).—The cost of feeding and the income from 50 herds of cows belonging to patrons of the creamery at Barron, Wis., for the year 1908 is presented in tabular form and the results discussed. The average number of cows in a herd was 10.6, the average cost of feed per cow $28.76, the average cash return from the creamery per cow $37.23, the average yield of butter fat per cow 139.5 lbs., the average price of butter fat 26.4 cts. per pound, the average cost of butter fat 21.6 cts. per pound, and the average value of butter fat per $1 of feed $1.35. The best herd showed a profit of $37.72 per cow and the poorest herd an average loss of $15.63 per cow.

[The cost of transporting a quart of milk], W. A. GRAUSTEIN (*New England Farmer, 88 (1909), No. 10, p. 3*).—According to a milk contractor's estimate the average cost of transporting milk within the radius of 100 miles of Boston is 1.19 cts. per quart.

The business of dairying, C. B. LANE (*New York and London, 1909, pp. XII+234, pl. 1, figs. 46, dgms. 2*).—The information contained in this book has been obtained largely from the author's experience and has been prepared for

the use of dairy students, purchasers and handlers of milk, and all who make dairying a business. After a short introduction on the farmer as a business man, the work is divided into six parts as follows: The soil, crops, the dairy herd, feeds and feeding, products, and sales. Considerable space is given to presenting forms and methods of keeping accurate accounts of expenditures and receipts in each line of work undertaken on the dairy farm.

Works on the science and practice of dairying during the first half of 1908, R. W. RAUDNITZ (*Separate from Monatsschr. Kinderheilk., 7 (1908), No. 7, pp. 46*).—This is a critical review of the literature on dairying published during this period.

Report of the dairy and cold storage commissioner, J. A. RUDDICK (*Rpt. Dairy and Cold Storage Comr. Canada, 1908, pp. 160, pls. 15*).—This report contains statistical matter on the progress of dairying, records of cow-testing associations, and an account of a visit to Great Britain and Holland.

Dairy production, 1907, A. BLUE (*Census and Statis. [Canada] Bul. 7, pp. IX+14+X*).—The statistics in this bulletin are compiled from the returns of 3,516 butter and cheese factories and 7 factories producing condensed milk and cream.

The value of the products of these factories is increasing annually, yet the dairying season of 1907 was not a good one owing to the prevailing drought in some localities. The text of the bulletin is also printed in French.

The past, the present, and the future of the dairy industry in the province of Quebec, J. C. CHAPAIS (*Rpt. Dairymen's Assoc. Prov. Quebec, 25 (1906), App., pp. 3–39, figs. 56*).—This is a lecture before the twenty-fifth annual convention of the dairymen's association, February, 1906.

Dairying in Denmark, 1907, B. BÖGGILD (*Tidsskr. Landökonomi, 1908, No. 4, pp. 225–243*).—The annual report of the professor of dairying in the Royal Veterinary and Agricultural College at Copenhagen.

Dairying in Norway prior to 1905, S. J. BENTERUD, J. GRUDE, and E. E. WOLD (*Mejeridriften i Norge indtil Aaret 1905. Christiania, 1908, pp. 234; rev. in Mælkeritid., 21 (1908), No. 49, pp. 969–976*).—An historical sketch of the Norwegian dairying industry, its development and present conditions.

Swedish dairying, A. OESTERGREN (*Nord. Mejeri Tidn., 23 (1908), Nos. 46, pp. 543–545; 47, pp. 555–556*).—An address delivered before the Swedish Dairy Instructors' Association. Statistics of the present conditions of the Swedish dairying industry and its progress during the past 15 years are given, with suggestions as to its future development. It is shown that there were 1,575 creameries in Sweden in 1905; these were supplied in the aggregate with 918,094,785 kg. (about 242,377,000 gals.) of milk from 1,763,857 milch cows. The average amount of milk handled per creamery daily is 1,335 kg. (about 352 gals.), ranging from 232 to 5,560 kg. Of the number of creameries given 470 were cooperative. The total number of patrons of the creameries was 70,647.

New Zealand dairy produce on the British market, D. CUDDIE (*New Zeal. Dept. Agr., Dairy Div. Bul. 12, pp. 45*).—This is a report of a visit to Great Britain, Denmark, Canada, and the United States with the view to obtain information that would be of value to New Zealand dairymen.

Biological and biochemical studies of milk, C. J. KONING (*Biologische und Biochemische Studien über Milch. Leipsic, 1908, No. 2, pp. 98, charts 2*).—This has been reported from another source (E. S. R., 19, pp. 371, 372).

Essentials of milk hygiene, C. O. JENSEN, trans. and amplified by L. PEARSON (*Philadelphia and London, 1909, 2. ed. rev., pp. X+291, figs. 24*).—This is the second edition of a work previously noted (E. S. R., 19, p. 275). "A few corrections and changes have been made in the text and new matter has been

added to give in detail what may be regarded as the official method for the examination of milk for bacteria and cells."

Milk as affected by stable practices and subsequent handling, M. H. Reynolds (*Amer. Vet. Rev., 32 (1908), No. 6, pp. 690–709, figs. 3, dgms. 3*).—This is a paper read before the American Veterinary Medical Association at its forty-fourth annual meeting and previously reported (E. S. R., 19, p. 199).

The influence of the sugars on the secretion of milk, G. Piantoni (*Arch. Farmacol. Sper. e Sci. Aff., 7 (1908), Nos. 7, pp. 329–336; 8–9, pp. 337–364*).—Hypodermic injections of disaccharids administered to a goat produced effects that varied with the amount injected. A small dose increased the amount of milk secreted without altering the proportion of its constituents. Larger doses diminished the quantity of milk and the percentage of milk sugar, and decreased slightly the percentage of fat, but increased the flow of urine which showed traces of sugar. Monosaccharids produce similar effects provided double the quantity is used. The sugar contained in the urine of the goat is lactose, which conforms with the assertion of Porcher.

On the variability of milk, G. von Wendt (*Skand. Arch. Physiol., 21 (1908), No. 2–3, pp. 89–145; Mitt. Landw. Inst. Leipzig, 1908, No. 9, pp. 127–179*).—Various salts were added to the rations of milch cows and their effect upon the chemical composition of the milk was studied. Some of the author's conclusions are as follows:

Common salt, carbonate of lime, sodium phosphate, magnesium bromid, and calcium glycero-phosphate appeared to have no influence on the composition of milk. Acid calcium phosphate appears sometimes to influence favorably the amount of fat and to increase the relative amount of original calcium. The percentage of albumin does not increase toward the end of the lactation period. Phosphorus, total nitrogen, and casein are the least variable, while chlorin, potassium, and albumin are the most variable of milk constituents.

The effect of rutting on the composition of cow's milk, O. Mezger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 16 (1908), No. 5, pp. 273–281*).—The author made chemical analyses of the milk of seven cows during the rutting period and found that such variations as occur are largely due to the individuality of the cows. In no case did the amount of fat-free dry matter vary to any extent.

On the composition of cow's milk of different breeds, with special reference to the lime and phosphoric acid content, T. Katayama (*Landw. Vers. Stat., 69 (1908), No. 5–6, pp. 342–358*).—Analyses were made of milk from cattle of Roumania, Ceylon, Korea, Africa, and different German breeds, and from the buffalo. There was a great variation between individuals of the same breed, but in the same individual the lime and phosphoric acid content varied but little from time to time. The lime content varied from 0.143 per cent in the East Prussian Holland breed to 0.227 in the black and white East Frisian. The phosphoric acid varied from 1.53 per cent in the buffalo to 0.299 in the Korean cattle.

On the variations of the globules of milk, G. Alessi and E. Carapelle (*Rev. Hyg. et Méd. Infant., 7 (1908), No. 4, pp. 309–329, pls. 3*).—A microscopic examination was made of milk from the goat, dog, guinea pig, and cow, as well as of human milk. The globules varied much in form and in size under normal as well as abnormal conditions. In some cases the fatty substance did not appear to fill the entire globule, while in other cases the presence of a viscous material caused the globules to form clusters. Pathological conditions cause many changes in the form and character of the globules.

Investigations on the viscosity and surface tension of milk, B. Kobler (*Arch. Physiol. [Pflüger], 125 (1908), No. 1–2, pp. 1–72, figs. 5; abs. in Rev.*

Gén. Lait, 7 (1909), No. 10, pp. 234–236).—According to the author both the surface tension and capillarity in milk are constant for a given animal under ordinary conditions, but are influenced by the character of the feed and other factors. The viscosity of milk depends upon the chemical composition and a number of physical properties. During the gestation period the viscosity gradually increases but rapidly diminishes a few days after calving.

The application of new physico-chemical methods of milk investigation from the socio-medical and physiological standpoint, H. Zanger (*Schweiz. Arch. Tierheilk., 50 (1908), No. 5, pp. 247–267; abs. in Milchw. Zentbl., 5 (1909), No. 2, pp. 86, 87*).—This article discusses the methods of determining physical constants previously reported by Schnorf (E. S. R., 16, p. 1016), and in the article noted above. Their importance for detecting adulterated and pathological milks is pointed out. The conclusions reached are based on the examination by the author and his assistant of 10,000 samples of milk.

Investigations on the rennet coagulation of milk, W. Van Dam (*Rev. Gén. Lait, 7 (1908), Nos. 6, pp. 121–129; 7, pp. 145–155; 8, pp. 169–178; Ztschr. Physiol. Chem., 58 (1909), No. 4, pp. 295–330, dgms. 3*).—Investigations were undertaken to discover the cause of variation in the coagulability of milk. By diluting milk with water or by adding a soluble citrate the time of coagulation was lengthened. The addition of a soluble oxalate rendered the milk incoagulable. On the other hand, the addition of calcium chlorid hastened coagulation. The author concludes that the time of coagulation is inversely proportional to the concentration of hydrogen in the milk.

The effect of some normal elements of milk on its coagulation with rennet, C. Gerber (*Compt. Rend. Soc. Biol. [Paris], 65 (1908), No. 26, pp. 182–184*).—The addition of lacto-casein and lactose retarded coagulation. Adding sodium chlorid and potassium chlorid in either small or large quantities hastened coagulation, but in medium quantities retarded it.

Further contributions to the theory of the coagulation of milk by rennet, G. Wernicken (*Ztschr. Biol., 52 (1908), No. 1–3, pp. 47–71, dgms. 16*).—After a study of the optical properties of milk and casein and their ability to combine with hydrochloric acid and alkali, both before and after adding rennet, the author does not agree with Laqueur that casein splits into paracasein and milk albumin. On the contrary, his results agree with Petry and Spiro (E. S. R., 18, p. 475).

Microscopical studies of the colostrum of cow's milk, P. Schulz (*Ztschr. Fleisch. u. Milchhyg., 19 (1908), No. 2, pp. 55–61; 19 (1909), No. 4, pp. 132–145; abs. in Rev. Gén. Lait, 7 (1909) No. 9, p. 210; Molk. Ztg. [Hildesheim], 23 (1909), No. 5, p. 110; N. Y. Produce Rev. and Amer. Cream., 27 (1909), No. 16, p. 654*).—The author reviews the literature on this subject and gives the results of his own investigations. Some of his conclusions are as follows:

The colostrum bodies disappear from the third to the eleventh day after calving, the length of time which they remain being independent of breed, yield of milk, age of the cow, nature of the feed, or the length of the dry period. During the first lactation period they remain longer than in the succeeding periods. They persist longer if the milking is imperfect or the secretion of milk is interfered with in any way. Occasionally they may persist in some cows during the entire lactation period.

Analyses of colostrum, M. Siegfeld (*Molk. Ztg., 22 (1908), No. 45, p. 1293; abs. in Milchw. Zentbl., 5 (1909), No. 1, pp. 37, 38*).—These analyses show a great range in chemical composition. The variations are due to the individuality of the cow and the length of time between calving and the milking period. The specific gravity varied from 1.031 to 1.083, the percentage of fat from 4.7 to 12, the protein from 5.42 to 23.75, and the carbohydrates from 1.60 to 3.50.

The proteolytic enzym of human milk, A. E. Austin (*Jour. Med. Research, 19 (1908), No. 2, pp. 309–319*).—Samples of milk from 21 persons at different periods of lactation were examined to determine why breast milk often disagrees with the healthy infant. No enzyms were found by Volhard's method, employed for trypsin. A modification of Rietschel's method was employed for the determination of rest nitrogen (nonprotein nitrogen). The results were variable and inexplicable.

"Before the subject here treated can be fully settled we must know more of the character of this rest nitrogen, and the most attractive feature is the possibility of the presence of amino acids." As a test for amino acid a combination of Ackermann and Levene's method was employed. No free glycocol, alamin, nor leucin were found. The results are summarized as follows:

"There is no evidence of autodigestion of human milk, at least under the conditions pertaining to such digestions in organ tissues.

"The digestive disturbances of infants fed on human milk can have no relation to such an enzym, as the milk of both healthy and sick women was examined.

"The rest nitrogen is still a riddle, though if amino acids compose a part of it they are remnants of a synthesis to protein, and not products of digestion of milk protein."

On the nucleon content of human milk, A. Valenti (*Arch. Farmacol. Sper. e Sci. Aff., 7 (1908), No. 10, pp. 447–459, charts 2; abs. in Chem. Zentbl., 1909, I, No. 2, p. 93*).—The author found that the average percentage of nucleon in human milk with three subjects tested three times a month was 0.1302, 0.1339, and 0.1305, respectively, and appeared to vary inversely with the amount of milk. The maximum amount of nucleon was in the first two or three months of lactation.

On milk secretion and the microscopical testing of milk, W. Winkler (*Ztschr. Landw. Versuchsw. Österr., 11 (1908), No. 6, pp. 562–630, pls. 4; abs. in Fühling's Landw. Ztg., 57 (1908), No. 19, p. 672*).—The results of a microscopical study of milk and the tissues of the mammary glands are reported and the work of other investigators is reviewed.

The author could distinguish four different cellular layers in the sections of the alveolus, as follows: (1) The membrana propia, described by Fürstenberg, which is composed of connective tissue; (2) a layer of muscular fibers that can contract the alveolus and force out the secretion; (3) a merismatic layer wherein nuclear division is very active during the lactation period; and (4) a layer of secretory epithelial cells.

The author believes that fat globules have a firm membrane, and that the "lactokonien" of Kreidl are granules of casein. Rancid milk may sometimes be caused by irregular-shaped fat globules formed in the udder. Leucocytes and lymphocytes are seldom found in milk. A distinction should be made between leucocytes and epithelial cells of milk.

Slimy milk, L. Eberlein (*Pure Products, 4 (1908), No. 11, pp. 494–499*).—This is a review of bacteriological investigations on the causes of slimy and colored milk.

Fermentations of milk and cheese. A. Koch (*Jahresber. Gärungs-Organismen, 16 (1905), pp. 259–351*).—A review of the articles on this subject for 1905.

On lactic-acid fermentation in milk, M. W. Beijerinck (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 10 (1907), pt. 1, pp. 17–34*).—This is mainly a discussion of the properties of different types of lactic-acid bacteria.

Lactic acid as an agent to reduce intestinal putrefaction, P. G. Heinemann (*Jour. Amer. Med. Assoc., 52 (1909), No. 5, pp. 372–376*).—The work of Metchnikoff and other observers is reviewed. The author's investigations with steril-

ized milk, self-coagulated milk, and the commercial preparations known as lactobacilline, fermenlactyl, kefilac, yoghourt, and latone led him to think, that so far as the therapeutic effect is concerned, there is yet no convincing evidence that sour milk prepared with commercial cultures is preferable to naturally soured milk. Yeasts were present in all but one of the commercial preparations.

Colloidal cream and process of making the same. L. M. Rousseau (*French Patent 392,253, Sept. 20, 1907; Jour. Soc. Chem. Indus., 27 (1908), No. 24, p. 1218*).—This is a patented process by which a colloidal preparation of casein containing 66 per cent of water is obtained by subjecting skim milk to centrifugal action. A sufficient amount of this preparation is added to fresh cream to make the total amount of casein in the product equal to one-fourth of the weight of the fat. The mixture is then heated to about 65°, homogenized under a pressure of 150 to 300 kg., and then sterilized.

The preservative action of boric acid in butter. M. A. O'Callaghan (*Agr. Gaz. N. S. Wales, 19 (1908), No. 12, pp. 1033–1035; 20 (1909), No. 2, pp. 148, 149*).—Experiments were undertaken to determine the proper quantity of boric acid to add to butter for preservative purposes without injuring the flavor or other qualities.

Ninety lbs. of butter was divided into three portions. To the first portion was added 3 per cent of salt; to the second, 3 per cent of salt and 0.25 per cent of a preservative consisting mainly of boric acid; and to the third portion, 3 per cent of salt and the preservative at the rate of 0.5 per cent. The butter was then worked in the ordinary manner.

At the end of 3 months the third portion would just pass for a first quality of frozen butter as regards flavor. The second portion showed evidences of decomposition, while the first portion was distinctly third class in flavor. Chemical analyses showed that about one-half of the boric acid was lost in working. A repetition of the experiment gave similar results.

[The effect of cold storage on the changes in butter]. L. A. Rogers (*Ice and Refrig., 36 (1909), No. 1, pp. 9–11, charts 3*).—This is a lecture before the eighteenth annual convention of the American Warehousemen's Association, held at Washington, D. C., December, 1908. According to the author's experiments so far it would seem that the condition of butter, after remaining in cold storage, is much more dependent on the methods of manufacture than on the storage temperature.

Butter. A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 170, pp. 19*).—This bulletin reports the analyses of 295 samples of butter.

A study of Argentine butters. P. Lavenir (*Crón. Agr. [Argentina], 2 (1908), No. 7–9, pp. 103–107*).—The physical and chemical properties of 8 samples of butter are determined and presented in tabular form.

Danish butter exports, 1907–8. B. Böggild (*Tidsskr. Landökonomi, 1908, No. 13, pp. 649–659*).—This is the usual annual review of the conditions of the Danish butter trade published by the author.

The imports of butter during the year ending September 30, 1908, were 31,192,000 Danish pounds, 21,000,000 of which came from Russia (largely Finland). The net exports amounted to 169,700,000 lbs., an increase of 8,600,000 lbs. over the exports of the preceding year, and the gross exports to 200,800,000 lbs. Of this quantity 183,970,000 lbs. went to England, an increase of a little over 6,000,000 lbs. over the figure for the preceding year. The domestic production of oleomargarine was 54,220,000 lbs. and the imports 6,570,000 lbs., making a total of 60,790,000 lbs. of oleomargarine consumed in Denmark during the year.

The average price received for the butter during the year was about 103 öre per pound (25.1 cts. per pound avoirdupois), an increase of about 6¼ öre (1.7 cts.) over the average price received during 1906 7.

Denmark's butter exports during the last 25 years, B. Bøggild (*Ugeskr. Landm., 53 (1908), No. 4, pp. 47–49*).—A review of the development of the industry since 1882, with statistics.

Refrigeration and Siberian butter (*Milch Ztg., 37 (1908), No. 45, p. 533*).—This is an account of the recent growth of the dairy industry in Siberia, which is already a successful competitor with Denmark and Holland in the London butter market. At the present time 36,000,000 kg. (about 8,182 tons) of butter are sent annually from Siberia to London and the amount is constantly increasing, this being due to improved methods, cheap transportation, and refrigeration.

The science and practice of cheese making, L. L. Van Slyke and C. A. Publow (*New York, 1909, pp. XVI+383, pl. 1, figs. 55*).—This work is intended as a text-book for students and as a reference book for the practical cheese maker. A large amount of space is devoted to Cheddar cheese making. The work is divided into five parts, viz, the manufacture of American Cheddar cheese, defects of American Cheddar cheese, the science of cheese making, methods of making different varieties of cheese, and methods of testing, factory organization and literature.

Cheese making, J. W. Decker, edited by F. W. Woll (*Madison, Wis., 1909, rev. ed., pp. 211, pl. 1, figs. 93*).—This is a fifth edition of this work. Among the new subjects discussed are the cold-curing and paraffining of Cheddar cheese, the use of the acidimeter, Hart's test for casein in milk, a synopsis of defects in American Cheddar cheese, and the manufacture of Camembert, Gouda, Italian, potted, sage and other kinds of fancy cheese.

Cheese, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 171, pp. 21*).—Analytical data regarding 237 samples of cheese are reported. Seventy-four per cent of the samples contained from 44 to 48 per cent of fat.

Some analyses of cream cheese, C. H. Cribb (*Analyst, 34 (1909), No. 395, pp. 45–48*).—The fat from 28 samples of cream cheese ranged from 0.63 to 75.6 per cent, though all but four samples were apparently made from whole milk or from a mixture of cream and milk.

The fat in cheese, G. Cornalba (*Indus. Latt. e Zootec., 7 (1909), No. 2, pp. 23, 24*).—Analyses of 31 samples of different kinds of Italian cheese are reported. The percentage of water ranged from 16.6 to 60, the fat from 8.2 to 41.5, and the protein from 16.3 to 50.9.

The fat content of Edam cheese, L. Müller (*Molk. Ztg., 22 (1908), No. 35, pp. 997–999*).—This is a discussion of the factors which influence the fat content of cheese and the methods of estimating it. Analyses of Edam and Limburger cheeses are also reported.

The cheese industry of Normandy, Beau (*Indus. Lait., [Paris], 33 (1908), No. 36, pp. 651–656*).—This is a discussion of the adaptability of the fertile soil in the Auge Valley. The cattle are chiefly of the Normandy breed. The principal dairy product is Camembert cheese, which had its origin in this region, having been first made in 1791.

The cheese industry in the Rhine Province (*Dept. Landb., Nijv. en Handel, Verslag. en Meded. Dir. Landb. [Netherlands], 1908, No. 6, pp. 85–102*).—A general survey of the growth of the cheese industry in that region since 1825.

Casein and its applications, F. W. Richardson (*Jour. Soc. Dyers and Colourists, 25 (1909), No. 1, pp. 4–8; abs. in Jour. Soc. Chem. Indus., 28 (1909),*

No. 3, p. 137).—In this article the methods of using casein for sizing cotton warps, for dressing for cotton and linen fabrics, and for waterproofing are discussed. Casein may also replace albumin in calico printing. Mention is made of the production of a noninflammable photographic film from casein and the possibility of its employment to "animalize" cotton so that it may dye like wool.

The characteristics of red currant seed oil, R. Kržizan (*Chem. Rev. Fett u. Harz Indus., 16 (1909), No. 1, pp. 1–3; abs. in Jour. Soc. Chem. Indus., 28 (1909), No. 2, p. 97; Analyst, 34 (1909), No. 396, p. 101*).—"The air-dried seeds of Italian and Bohemian red currants yielded on extraction with petroleum spirit 16 and 18.5 per cent of oil, respectively. In each case the oil was of an orange-yellow color and had an odor resembling that of linseed oil. In the film test the oils dried in 3 to 4 days, yielding an elastic skin." Other values of these oils are also given.

Oil from "Carapa guyanensis" (Carapa procera, DC.), J. Lewkowitsch (*Analyst, 34 (1909), No. 394, pp. 10, 11; abs. in Jour. Soc. Chem. Indus., 28 (1909), No. 3, p. 150*).—Physical and chemical properties of this oil are given.

The rate of fermentation of ciders and perries, B. T. P. Barker (*Jour. Agr. Sci., 3 (1908), No. 1, pp. 1–21*).—A study was made of the influence of various factors on the rate of fermentation. The main factor appears to be the amount of nitrogenous matter present in the juice which is assimilable by the yeast. The variety of fruit, state of ripeness, aeration of the juice, and temperature also have some influence, but the kind of yeast and the chemical constituents in the juice other than nitrogenous compounds do not appear to be influential factors. A certain measure of control over the rate of fermentation can be exercised by the cider maker.

Acetic aldehyde in wine, its origin, and its significance, A. Trillat (*Ann. Inst. Pasteur, 22 (1908), Nos. 9, pp. 704–719; 10, pp. 753–762; 11, pp. 876–895; Bul. Assoc. Chim. Sucr. et Distill., 26 (1909), No. 8, pp. 654–690*).—The author reviews the work of other investigators, and describes in detail his own experiments concerning the various factors which influence the amount of acetic aldehyde in wines and brandies. Acetic aldehyde is formed by the oxidation of alcohol under the influence of the air and participates more or less in all the principal modifications which take place in wine.

Malic acid in wine making. Malo-lactic fermentations, W. Mestrezat (*Jour. Pharm. et Chim., 6. ser., 28 (1908), No. 1, pp. 13–20*).—After reviewing the work on this subject the author maintains that a malo-lactic fermentation does not necessarily take place because of the disappearance of malic acid.

Report of the Swiss experiment station for horticulture and wine making at Wädenswil for 1905–6, H. Müller-Thurgau (*Landw. Jahrb. Schweiz, 22 (1908), No. 14, pp. 745–920, figs. 10*).—This is the annual report of work done at this station on the diseases of fruits, variety tests of grapes, wine fermentation, tests of different kinds of yeasts, and related topics.

Agricultural and industrial distillation, E. Boullanger (*Industries de Fermentation Distillerie Agricole et Industrielle. Paris, 1909, pp. XI+554, figs. 107*).—This work treats of the distillation of industrial alcohol, brandies, and rums both from the practical and theoretical standpoint. The principal topics treated are the properties and uses of alcohol, methods of determining the chemical composition of beets, molasses, fruits, and other materials used in distilling, the methods of preparing and fermenting different musts, the distillation and rectification of alcohol, and the composition and utilization of by-products of distilleries. There is some statistical informaton on the alcohol industry and also a chapter on alcoholometry.

VETERINARY MEDICINE.

Veterinary materia medica and therapeutics, K. Winslow (*New York, 1908, 6. ed., rev. and enl., pp. VIII+859*).—A sixth revised edition of this work of which that part of the text treating of the physiological action of drugs has been almost completely rewritten on the basis of recent pharmacological investigations.

Further studies upon anaphylaxis, M. J. Rosenau and J. F. Anderson (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 45, pp. 65; abs. in Jour. Med. Research, 19 (1908), No. 1, pp. 37–66; Bul. Inst. Pasteur, 6 (1908), No. 18, pp. 827–829*).—"The period of incubation of serum anaphylaxis is about 7 days in guinea pigs sensitized in the brain and about 9 days in guinea pigs sensitized subcutaneously. It also appears that the sensitization comes on somewhat gradually. . . . The sensitizing principle is gradually influenced by heat. It disappears almost entirely when horse serum is heated to 100° C. for 1 hour. . . . The toxic principle in horse serum is gradually destroyed by heat. . . . The toxicity of horse serum does not appear to diminish with the age of the serum. . . .

"The specific nature of anaphylaxis is further shown by various experiments. . . . A substance known as 'anaphylactin' is present in the blood serum of sensitized guinea pigs. This substance is not present during the period of incubation. We have been unable to demonstrate the presence of anaphylactin in the blood serum of man, the monkey, and the cat. . . . We believe that these morphological alterations do not explain the mechanism of anaphylaxis. It is probable that the mechanism will not be unraveled until further light is shed upon the chemistry of protein metabolism. . . . The repeated injection of small amounts of horse serum sensitizes guinea pigs. Repeated injections of large amounts render guinea pigs partially immune. . . . We suggest a possible relation between the toxemias of pregnancy and anaphylaxis."

Investigations of the leucocytes and lymphoid tissue of invertebrates, M. Kollmann (*Ann. Sci. Nat. Zool., 9. ser., 8 (1908), No. 1–4, pp. 1–6*).—The investigations are reported in three parts. Part 1 is devoted to a review of the literature and to important questions of technique. In part 2 details are given of the results of studies in the various groups while in part 3 is found a synthetic review of the investigation and the conclusions therefrom. A bibliographical list is given.

Further notes on rat leprosy and on the fate of human and rat lepra bacilli in flies, W. B. Wherry (*Jour. Infec. Diseases, 5 (1908), No. 5, pp. 507–514*).—While engaged in plague work in California the author made careful search for leprosy in rats in view of the possibility of blood-sucking insects playing some rôle in the transmission of the disease. Out of 9,361 rats dissected during a period of 4 months in the summer of 1908, 20 were found infected with leprosy. There is said to be no evidence, however, that human leprosy and rat leprosy are identical or that human beings need fear infection from leper rats.

Experiments were made in which flies in the larval and adult stages were fed upon the carcass of a leper rat. Both stages were found to ingest the bacilli in enormous numbers. The bacilli did not appear to multiply in the flies (*Calliphora vomitoria, Lucilia cæsar,* and *Musca domestica*) as they were clear of bacilli in less than 48 hours.

Larvæ of *C. vomitoria* heavily infested did not appear to be capable of developing further than the nymphal stage. "A fly caught on the face of a human leper was found to be infested with leper-like bacilli. These were few in num-

ber at the beginning of the observation, but on the third day more than 1,152 were present in each speck deposited. Only one bacillus was found between the third and sixth day and the acid-proof bacilli were not infective when injected into the subcutaneous tissue of a guinea pig."

The etiology and diagnosis of hydrophobia, Anna W. Williams and May M. Lowden (*Ann. Rpt. Dept. Health City of New York, 1906, vol. 2, pp. 635–671*).—Some of the conclusions drawn by the authors following the investigation here reported are:

"The smear method of examining the Negri bodies is superior to any other method so far published. . . .

"The Negri bodies as shown by the smears as well as by the sections are specific to hydrophobia.

"Numerous 'bodies' are found in fixed virus. 'Bodies' are found before the beginning of visible symptoms—i. e., on the fourth day in fixed virus, on the seventh day in street virus, and evidence is given that they may be found early enough to account for the appearance of infectivity in the host tissues. Forms similar in structure and staining qualities to the others, but just within the limits of visible structure at 1,500 diameter magnification have been seen. Such tiny forms, considering the evidence they give of plasticity, might be able to pass the coarser Berkefeld filters.

"The Negri bodies are organisms belonging to the class Protozoa. The reasons for this conclusion are: (a) They have a definite characteristic morphology; (b) this morphology is constantly cyclic, i. e., certain forms always predominate in certain stages of the disease, and a definite series of forms indicating growth and multiplication can be demonstrated; (c) the structure and staining qualities as shown especially by the smear method of examination resemble that of certain known Protozoa, notably of those belonging to the suborder Microsporidia. The proof that the 'Negri bodies' are living organisms is sufficient proof that they are the cause of hydrophobia."

The prevalence of hydrophobia in the Philippine Islands, F. W. Dudley (*Jour. Amer. Med. Assoc., 51 (1908), No. 25, pp. 2143–2149*).—In response to circulars mailed by the author, cases which largely occurred between October 1, 1902, and February 28, 1907, were reported as follows: In 253 dogs, 3 cats, 1 carabao, 1 cow, 4 horses, 2 pigs, 3 rats, and 1 monkey. Thirty-nine provinces were shown to have been infected by the disease, 16 having escaped according to reports. The author considers the disease sufficiently prevalent to warrant the Government in providing means for the Pasteur treatment.

Transmission of rabies to mice by ingestion, P. Remlinger (*Compt. Rend. Soc. Biol. [Paris], 65 (1908), No. 30, pp. 385, 386*).—Experiments indicate that mice can contract rabies not only when bit by an affected dog or cat but also when they eat virulent parts of an animal dead from the disease.

Experiments on the production of antirabic serum, D. W. Poor and P. J. Friedman (*Ann. Rpt. Dept. Health City of New York, 1906, vol. 2, pp. 682–692*).—The following conclusions have been drawn from the experiments reported:

"It is possible to produce a strong immune serum against rabic virus, in rabbits, sheep, dogs, and horses.

"For the production of such a serum a long course of treatment is necessary.

"This serum when fresh prolongs the incubation of rabies when injected into test animals a short time after infection."

Note on the investigation of cattle disease in the Protectorate of Sierra Leone, F. Harvey (*Jour. Roy. Army Med. Corps, 10 (1908), No. 1, pp. 41–44, map 1; abs. in Bul. Inst. Pasteur, 6 (1908), No. 19, p. 883*).—An account of a trypanosomiasis that is apparently fatal to cattle, horses, dogs, goats, and prob-

ably mules, sheep, and other domestic animals. A description is given of the species, which Mesnil considers as probably *Trypanosoma dimorphon*.

Notes on the duration and course of camel surra, H. T. Pease and S. H. Gaiger (*Jour. Trop. Vet. Sci., 3 (1908), No. 4, pp. 427–433*).—The percentage of camels that recover from surra seems to be low. They appear to be in an intermediate stage of tolerance and it is possible that they are gradually acquiring an immunity similar to that of Indian cattle.

Natural canine surra, S. H. Gaiger (*Jour. Trop. Vet. Sci., 3 (1908), No. 4, pp. 443–451, charts 11*).—Examinations made by the author in India of the blood of several hundred dogs resulted in the finding of but one case of natural surra. A report is presented of the symptoms in this dog and in other animals, including the horse, dog, rabbit, guinea pig, and white mouse, inoculated subcutaneously with blood from the natural case. These inoculations are said to show that the dog was probably infected from the horse.

"In the Punjab we have to deal with only one type of trypanosome but with two strains, a camel strain and an equine strain, which can not be distinguished morphologically, but can be distinguished by the virulence of the disease they produce in animals experimentally inoculated or naturally infected. By a series of inoculations one strain may take on the characters of the other. The 'camel surra' trypanosome by passage through several horses comes up to the standard of virulence of what might be called the 'horse surra' trypanosome."

Treatment of surra by atoxyl and orpiment, J. D. E. Holmes (*Jour. Trop. Vet. Sci., 3 (1908), No. 4, pp. 434–442*).—In the experiments here recorded the results obtained by Laveran and Thiroux (E. S. R., 20, p. 579) from the use of atoxyl in subcutaneous injections alternated with trisulphid of arsenic by mouth were confirmed. The horse, guinea pig, and rabbit were used in these experiments.

"Solutions of atoxyl up to 15 per cent can be given intravenously and subcutaneously without injury to the tissue. In our experiments we found that the lower dilutions were preferable, as they were absorbed more readily and caused less irritation at the seat of inoculation. For horses, a 4 per cent solution and for small animals, a 1 per cent solution was adopted. The horse can tolerate 5.5 gm. of atoxyl per 500 lbs. body weight, administered intravenously. Subcutaneously somewhat less than double this amount can be administered without any toxic effect. In the guinea pig 0.06 gm. per 500 gm. body weight is the maximum amount which can be injected subcutaneously with safety. In the treatment of surra with atoxyl it is not necessary to use large doses. About a quarter of the toxic amount is sufficient."

The relation of human and bovine tuberculosis, R. Koch (*Tuberculosis, 7 (1908), No. 11, pp. 491–505; Jour. Compar. Path. and Ther., 21 (1908), No. 4, pp. 303–308*).—This is a paper presented at the International Congress on Tuberculosis held in Washington, D. C., in 1908.

Attention having been called by Dr. Theobald Smith to certain differences between the tubercle bacilli found in man and cattle, experiments were conducted in cooperation with Schütz. The conclusions arrived at are similar to those presented at the British Congress on Tuberculosis in 1901, viz: "The tubercle bacilli of human tuberculosis are different from those of bovine tuberculosis. Human beings may be infected by bovine tubercle bacilli, but serious diseases from this cause occur very rarely. Preventive measures against tuberculosis should therefore be directed primarily against the propagation of human tubercle bacilli." It is stated that there are many possible sources of error in the work and that it is only when such have been excluded that the results can be accepted as conclusive.

Infection of dogs with human and bovine types of the tubercle bacillus, C. Titze and O. Weidanz (*Tuberkulose Arb. K. Gsudhtsamt., 1908, No. 9, pp. 79–92; abs. in Bul. Inst. Pasteur, 6 (1908), No. 22, p. 1006*).—The authors first consider the statistics relating to the frequency of the disease and review the literature on the subject. From inoculation experiments it is concluded that dogs are very resistant to both the human and bovine types of the bacillus, whatever the manner of introduction. This appears to be a natural immunity possessed even by young dogs. Tuberculous dogs were found to react to tuberculin. A bibliography is appended.

Tuberculosis of parrots and canaries, A. Weber, C. Titze, and O. Weidanz (*Tuberkulose Arb. K. Gsudhtsamt., 1908, No. 9, pp. 59–78; abs. in Bul. Inst., Pasteur, 6 (1908), No. 22, pp. 1004, 1005*).—Parrots were infected in various ways with the bovine, human, and fowl types of the tubercle bacillus. While they were susceptible to the 3 types, the bovine type was most virulent and the fowl type the least so.

Experiments are also reported in which the 3 types were ingested by canaries. The fowl type was found to be the most virulent.

The ophthalmic reaction to tuberculin, Le D. Bailliart (*Jour. Compar. Path. and Ther., 21 (1908), No. 4, pp. 308–321*).—This is a report presented on behalf of the Société de Pathologie Comparée to the International Congress on Tuberculosis held at Washington, D. C., in 1908. The following are the conclusions arrived at:

"The ophthalmic test is a method of diagnosis which is, in general, without danger when applied to eyes that are quite free from any tuberculous lesions. It is sometimes followed by slight and temporary ill effects. The reaction is not always proportionate to the extent of the lesions. It is often absent in the last stages of the disease. It is sometimes followed by systemic disturbance, which is always inconsiderable and lasts only for a short time. Very often the reaction is doubtful. In bovines, because of the difficulties of examination, doubtful cases should be considered negative. . . .

"In bovines the ophthalmic test alone is a very untrustworthy method, and can not pretend to replace the ordinary subcutaneous injection. The secondary ocular reaction gives results which are far superior. In the vast majority of cases the two processes, simple subcutaneous injection and the combined ophthalmic reaction, give the same results.

"Exceptionally, a tuberculous animal does not react to this second ocular test. More frequently one gets a positive ophthalmic reaction in a nontuberculous animal. Although the combined ophthalmic reaction can not replace the subcutaneous injection of tuberculin as a means of diagnosis, it remains a useful method, far more simple, and of genuine utility in certain circumstances."

Five years' experience of protective inoculation against tuberculosis in cattle by von Behring's method, Strelinger (*Berlin. Tierärztl. Wchnschr., 1908, No. 22, pp. 385–388; abs. in Jour. Compar. Path. and Ther., 21 (1908), No. 3, pp. 220–225*).—The author reports inoculation experiments conducted at Sávár, Hungary, in which von Behring's directions were punctiliously observed. Attention is called to the importance of choosing only quite young and healthy animals.

"Our experience shows that bovovaccination is capable of conferring marked protection against infection for a period of 5½ years, the percentage of 5½-year-old animals protected by bovovaccination, and which reacted when afterwards submitted to tuberculin, only numbering 10 per cent, whilst before the introduction of protective inoculation 50 per cent of 2-year-old artificially reared animals reacted to tuberculin.

"When we further consider that such good results can also be obtained on farms in which the inoculated calves are constantly kept together with highly tuberculous cows, it is plain that protective inoculation can be carried out with good results under ordinary agricultural conditions, and it seems justifiable to conclude that the power of resistance against tuberculous infection conferred on animals by bovovaccination, having already lasted over 5 years, will probably prove to continue for some years longer.

"Taking everything into consideration, I consider it absolutely superfluous to repeat the protective inoculation every year, as has recently been suggested. According to my view, inoculation should not be repeated even once, on account of the possibility of infection through the milk.

"Instead of repeating the inoculation, I would recommend that, as far as economically possible, suitable hygienic measures should be adopted."

It is pointed out that the danger of animals from tubercle-free farms from becoming infected if removed to other centers obtains under the methods of Bang and Ostertag. It is therefore of great importance that cattle not only be protected from tuberculosis infection, but also that an active resistance be conferred. The author considers a combination of Ostertag's method with von Behring's bovovaccination as the remedy sought for. The following are considered the most important points in such a combined method:

"The most important condition, in my estimation, is that the bovovaccination should be carried out with the most scrupulous care and exactly in accordance with von Behring's directions.

"The method of testing, by tuberculin, the adult animals protected by von Behring's method should be discontinued, and only employed in special cases. For it should be substituted exact clinical tests of the whole number of animals at fixed intervals.

"The tuberculin testing of the calves recommended by Ostertag can in the combined method be discontinued, inasmuch as the bovovaccine injections exhibit an action similar to tuberculin. (I may add that we have often noted that calves which react typically during the protective inoculation have later proved to be infected.)

"By combining the two methods, the artificial rearing of the calves, as recommended by Ostertag, could be discontinued, for our experiments have shown that calves develop just as well under ordinary agricultural conditions as those reared artificially, provided they have been protectively inoculated in early life. This appears to me an advantage of the combined method which should not be overlooked, because in agricultural practice artificial rearing is often difficult to carry out."

The vaccination of cattle against tuberculosis, T. Smith (*Jour. Med. Research, 18 (1908), No. 3, pp. 451–485; abs. in Bul. Inst. Pasteur, 6 (1908), No. 23, p. 1038*).—"Vaccination of calves with the human type of the tubercle bacillus is harmless. Cases in which injuries are said to have resulted from it may have been due to other concomitant affections, among which pneumonia is probably the most common. Persons trying vaccination should first assure themselves that the culture they intend to use belongs to the human and not to the bovine type of the bacillus.

"Vaccination with the human type of bacillus leads to a relatively high resistance to fatal doses of the bovine bacillus.

"Vaccination with a carefully tested, attenuated bovine bacillus may be as efficacious, even in a single injection, as the double vaccination with human bacilli. Such vaccination may be less dangerous to man than when human bacilli are used.

"The immunity conferred by vaccination, as hitherto practiced, does not appear to be satisfactory as regards degree or duration. More evidence is needed with regard to these points. The herds of large public institutions are well adapted to decide these questions if vaccination is thoroughly applied, and the animals supervised by properly trained men.

"Insufficient immunity following vaccination may prove dangerous in giving rise to mild cases, after ordinary exposure in infected herds, which tend to discharge tubercle bacilli from small foci in the lungs.

"The immunity acquired by two vaccinations with human bacilli should be fortified by a subsequent injection of attenuated bovine bacilli.

"Investigations should be made looking toward the selection, by the injection of attenuated bovine bacilli, of races or breeds of cattle which possess naturally a high degree of resistance to tuberculosis. The capacity of different breeds to acquire a high degree of immunity should also be investigated.

"The survival of human and bovine bacilli in the lungs and udders of calves vaccinated intravenously with them should be more definitely determined.

"Vaccines may be easily and cheaply prepared in the form of suspensions in fluids ready for injection. The length of time during which suspensions maintain their highest efficiency remains to be determined."

The vaccination of cattle against tuberculosis, J. F. Heymans (*Arch. Internat. Pharmacod. et Thér., 17 (1907), No. 1–2, pp. 133–146; 18 (1908), No. 3–4, pp. 179–203*).—Details of investigations previously noted (E. S. R., 20, p. 877).

Phagocytic immunity, J. C. Meakins (*Jour. Expt. Med., 11 (1909), No. 1, pp. 100–117, charts 6*).—From the experiments here described it is concluded that animals immunized with living tubercle bacilli may develop phagocytic immunity of a high degree and that such immunity may help to protect the animal from a lethal dose of virulent tubercle bacilli.

Further filtration experiments with virus of cattle plague, E. H. Ruediger (*Philippine Jour. Sci., B. Med. Sci., 3 (1908), No. 4, pp. 319–321, charts 11*).—A continuation of investigations in which experiments with peritoneal fluids (E. S. R., 20, p. 790) were repeated. The author concludes that peritoneal fluid retains its virulence on being passed through Berkefeld filters marked V, N, or W, but is harmless after having been passed through a Chamberland filter marked B.

Tick fever, or redwater, S. Dodd (*Dept. Agr. and Stock, Vet. Dir., Queensland, Bul. 2, 1908; Queensland Agr. Jour., 21 (1908), Nos. 5, pp. 245–251; 6, pp. 308–317, fig. 1; abs. in Vet. Rec., 21 (1909), No. 1069, p. 438*).—An account of the history, causation, symptoms, post-mortem appearance, and preventive and curative treatment of this disease, including the life history of *Margaropus (Rhipicephalus) australis*. Preventive inoculation and eradication of the ticks are considered at length.

Report on methods adopted for the eradication of cattle ticks in the United States of America, S. Dodd (*Queensland Agr. Jour., 21 (1908), No. 1, pp. 47–51*).—A summary is given of the work that has been carried on in this country up to the end of 1907.

Contributions to a biological study of Bacillus vitulisepticus and to the immunization of calves against septicemic pneumonia, H. Schirop (*Centbl. Bakt. [etc.], 1. Abt., Orig., 47 (1908), No. 3, pp. 307–342; abs. in Bul. Inst. Pasteur, 6 (1908), No. 20 pp. 917, 918*).—After studying *Bacillus vitulisepticus* in different media and its pathogenic power for different species of animals, the author conducted immunization experiments. He concludes that there are many races of the bacillus since the monovalent serum protects animals against the race used in preparing the serum but only rarely against others.

The etiology of white scour in calves, C. Titze and A. Weichel (*Berlin. Tierärztl. Wchnschr., 1908, No. 26, pp. 457, 458; abs. in Jour. Compar. Path. and Ther., 21 (1908), No. 3, pp. 271–273*).—In corroboration of the work of Jensen and others, the authors have found that feeding with small quantities of cultures of various kinds of bacilli produces a severe diarrhea in young calves which often ends in death. In a spontaneous outbreak of white scour, in which 5 out of 20 calves died, the authors accidentally obtained from the intestinal contents the so-called bacillus of hog cholera. The same bacillus was also found in the dung of healthy horses. In another enzootic of white scour investigated, *Bacillus enteritidis* appeared to be the cause of the diarrhea.

In order to determine the relationship that obtains between the individual varieties of typhoid bacilli found in white scour and to determine whether or not the meat poisoning bacilli play an important part, the authors examined 200 different varieties of white-scour organisms which had been isolated during numerous outbreaks of white scour occurring over almost the whole of Prussia. These were named according to their morphological and biological properties and their agglutinative effects. Of the organisms found, 151 specimens appeared to be the common *B. coli*, 28 the paracolon bacillus of Jensen, 14 the pseudocolon bacillus of Poels, 2 the *B. proteus*, and 1 the *Bacterium acidi lactici*, while 4 varieties could not be determined because they arrived in an impure state.

The authors consider it possible that the cause of white scour and of pneumonia of calves is of the nature of an ultravisible virus.

Diarrhea in calves, E. L. Vallejo (*Estac. Agr. Cent. [Mexico] Circ. 9, pp. 6*).—A general account of the disease.

A new Indian tick, Ornithodoros lahoriensis, L. G. Neumann (*Jour. Trop. Vet. Sci., 3 (1908), No. 4, pp. 462–467, figs. 4*).—This tick, taken upon sheep in India and reported to transmit a disease of sheep, is here described as new. According to the natives the tick appears to infest old sheepfolds, living in cracks and crevices and attacking sheep in November and December and the winter months. While the exact nature of the disease has not yet been determined it is said to be a pernicious anemia.

Infectious mastitis of the goat, W. R. L. Best (*Philippine Agr. Rev. [English Ed.], 1 (1908), No. 8, pp. 335–337*).—A general account of the symptoms and nature of this disease with prophylactic measures and remedial treatment.

Swine plague, W. Jowett (*Jour. Compar. Path. and Ther., 21 (1908), No. 4, pp. 321–324*).—The author here records an observation in which swine plague occurred unaccompanied by post-mortem lesions that resembled hog cholera. It is said that while hog cholera was quite prevalent in Cape Colony in 1904 it has apparently been stamped out. Post-mortem findings are reported in detail.

Cure of a stallion suffering from dourine by means of atoxyl at the remount depot at Constantine, M. Moxod (*Bul. Soc. Cent. Méd. Vét., 85 (1908), No. 12, pp. 303–309, chart 1; Jour. Trop. Vet. Sci., 3 (1908), No. 4, pp. 456–461*).—The author considers that it would be imprudent to conclude from a single case that atoxyl is a specific against dourine. The action of the drug, however, is said to have been well marked, though the usefulness of this stallion as a sire still remains to be determined. Given in progressive and intermittent doses atoxyl is borne well by the horse. The dog is said to be an uncertain test animal in this disease.

The agglutination test as applied to the diagnosis of glanders, K. R. Collins (*Am. Rpt. Dept. Health City of New York, 1906, vol. 2, pp. 693–704*).—This is a preliminary summary of investigations conducted, from which it is concluded that at present the value of the test lies in its use as an indicator for the mallein test. A later report has already been noted (E. S. R., 20, p. 879).

What should each dog owner know? T. Ritt (*Was muss jeder Hundebesitzer wissen? Stuttgart, 1908, pp. VIII+112, pl. 1, figs. 21*).—The aim of this work is to inform dog owners concerning their duties in order to prevent dogs from spreading diseases and parasites injurious to man and domesticated animals. Instructions are given concerning the care and management of dogs, with brief descriptions of diseases which may be transmitted by them. There is also a digest of the laws and police ordinances relating to dogs in Germany, Austria, and Switzerland.

A contribution to the study of follicular mange in the dog, N. Almond (*Vet. Rec., 21 (1909), No. 1069, pp. 428–430*).—A 2.5 per cent solution of zinc chlorid in water has been used with success by the author in treating this disease in dogs. Applications were made with a sponge at night and in the morning.

Contributions to the morphology and life history of Piroplasma canis, A. Breinl and E. Hindle (*Ann. Trop. Med. and Par., 2 (1908), No. 3, pp. 233–248, pls. 4; abs. in Bul. Inst. Pasteur, 6 (1908), No. 20, pp. 909, 910, figs. 5*).—The studies here reported were made with a strain sufficiently virulent to kill all the dogs infected. In regard to the flagellate forms the authors report as follows: "Very rarely true small flagellate forms were seen, especially in blood from the lung; but we were never able to trace the origin of the single flagellum. . . . We have been able to trace the development of large biflagellate forms from the normal intracellular parasite. . . . These observations appear to point to the fact that the biflagellate forms of *P. canis* represent a very transient stage in its life history."

The development of Piroplasma canis in culture, G. H. F. Nuttall and G. S. Graham-Smith (*Parasitology, 1 (1908), No. 3, pp. 243–260, pl. 1, fig. 1*).—The details are presented of studies made by the authors of the development of *P. canis* in vitro.

The mode of multiplication of Piroplasma bovis, P. pitheci in the circulating blood compared with that of P. canis, with notes on other species of Piroplasma, G. H. F. Nuttall and G. S. Graham-Smith (*Parasitology, 1 (1908), No. 2, pp. 134–142, pl. 1, dgms. 4; abs. in Bul. Inst. Pasteur, 6 (1908), No. 20, pp. 910, 911*).—"In stained preparations *P. canis*, *P. bovis*, and *P. pitheci* may be distinguished from other intracorpuscular parasites by the presence of intracorpuscular pyriform bodies, usually occurring in pairs and less commonly in fours, eights, and sixteens. These pyriform bodies show a dense mass of chromatin near the pointed end and a loose mass, often connected with the dense mass, situated toward the blunt end. In suitable preparations peculiar dividing forms, most typically represented by trilobed forms or more or less pyriform bodies joined to a single smaller rounded or elongated mass of protoplasm, may be seen.

"In the absence of observations on the living parasite we consider that these points may be taken as characteristic of the genus Piroplasma.

"In spite of the fact that dividing forms have not yet been found and that the secondary mass of chromatin has not yet been observed *P. muris* may perhaps be included in this genus.

"*P. quadrigeminum*, an intracorpuscular parasite recently observed by Nicolle in a small North African rodent (*Ctenodactylus gundi*), apparently divides in a totally different manner, and shows a peculiar disposition of the chromatin. No loose chromatin has been observed. Until further observations have been made this parasite can not be included among the true Piroplasma.

"Further observations are needed before the position of the other so-called Piroplasma can be determined."

Observations on the piroplasmosis of cattle in Indo-China, and proof of piroplasmosis among buffaloes. H. Schein (*Ann. Inst. Pasteur, 22 (1908), No. 12, pp. 1005–1011, figs 17, dym. 1*).—The author has studied the forms of piroplasma found in the blood of cattle in Indo-China, and here presents the results of several observations in detail. The bigeminal pear-shaped form was less frequently met with than the bacillary and ovoid forms. The pear-shaped form only appears at the height of the disease, namely, from the seventh to the tenth day after inoculation. Occasionally animals were met with which only showed the bacillary form.

In buffaloes examined the ovoid form was more frequently found than the bacillary, while the pear-shaped form was not discovered.

A new microbe pathogenic in cats. Z. Skrzynski (*Ann. Inst. Pasteur, 22 (1908), No. 8, pp. 682–688; abs. in Bul. Inst. Pasteur, 6 (1908), No. 20, p. 916*).—A new microbe that belongs to the *Bacillus coli* group was isolated from a disease epizootic in cats.

Investigations of epithelioma contagiosum of fowls. B. Lipschütz (*Centbl. Bakt. [etc.], 1 Abt., Orig., 46 (1908), No. 7, pp. 609–622; abs. in Bul. Inst. Pasteur, 6 (1908), No. 16, pp. 745, 746*).—This is a contribution from the Pasteur Institute at Paris, in which the author reports microscopical studies, culture and immunization experiments, and investigations made of the influence of substances on the virus.

The micrococci are stained by the methods of Löffler and Giemsa and feebly by Ziehl's stain. A 10 per cent solution of atoxyl did not attenuate the virus in vitro. Exposed to a 1 per cent solution of saponin for 1 hour the virus was not affected, but after 24 hours it appeared attenuated. A 10 per cent solution of sodium taurochlorate destroyed the virulence of the virus (in a concentrated medium) in 2 hours. The virus was not cultivated artificially. It was found present in the internal organs and also within the brain of diseased and recovered pigeons.

Culture in vitro of the fowl plague virus. E. Marchoux (*Compt. Rend. Acad. Sci. [Paris], 147 (1908), No. 6, pp. 357–359; abs. in Bul. Inst. Pasteur, 6 (1908), No. 20, p. 904*).—The author has obtained 10 transplantations in which one-fifth of 1 cc. of the virus was sufficiently virulent to kill a fowl in 2 days.

Spirochetosis of fowls in South Oran. Transmission of this disease by Argas persicus. E. Brumpt and Foley (*Compt. Rend. Soc. Biol. [Paris], 65 (1908), No. 26, pp. 132–134; abs. in Bul. Inst. Pasteur, 6 (1908), No. 21, pp. 964, 965*).—Experiments are here reported which show the incubation period of spirochetosis of fowls to be about 6½ days, and that at Beni-Ounif about 1 in every 6 of the Argasids are infected. The spirochætes transmitted by *A. persicus* are identical with the *Spirochæta gallinarum* discovered by Marchoux and Salimbeni in Brazil.

The air-sac mite. L. V. Nathan (*Jour. Dept. Agr. West. Aust., 17 (1908), No. 5, pp. 853–856, fig. 1*).—The author reports this mite (*Cytodites nudus*) as the source of a disease that is "decimating the poultry yards of the gold fields" in western Australia. He has also observed the disease in birds in South Australia.

Epizootic pneumo-pericarditis in the turkey. W. Jowett (*Jour. Compar. Path. and Ther., 21 (1908), No. 4, pp. 324–330, figs. 2; Agr. Jour. Cape Good Hope, 34 (1909), No. 1, pp. 42–45*).—This disease, said to have been first described by M'Fadyean in England, is reported by the writer as having occurred in a large flock near Capetown, South Africa. Inoculations and post-mortem examinations are reported and the causal organism is described. In the out-

break reported fowls, geese, and pigeons were in close contact with diseased turkeys but were not affected.

Notes on ostrich parasites, W. ROBERTSON (*Agr. Jour. Cape Good Hope, 33 (1908), No. 5, pp. 583–588, figs. 6*).—The ostrich tapeworm (*Tænia struthionis*) and the wireworm (*Strongylus douglasii*) are here described. A species closely related to the guinea worm of man is also mentioned.

The cestodes of birds, O. FUHRMANN (*Zool. Jahrb., 1908, Sup. 10, No. 1, pp. 232*).—A monograph based upon museum and private European collections. From 544 species of birds 495 cestode parasites are recorded. These parasites are shown to be of great importance in zoogeographic investigations. In the faunistic section a list is given of the hosts, with their distribution and cestode parasites.

An alphabetical index is given of the families, genera, and species. The last 20 pages are devoted to a bibliography.

Note on the behavior of Spirochætæ in Acanthia lectularia, G. H. F. NUTTALL (*Parasitology, 1 (1908), No. 2, pp. 143–151*).—The experiments reported "show that *Spirochæta duttoni* retains its virulence after a sojourn of 5 or more days in the intestine of *Acanthia lectularia* when the insect is maintained at a temperature of 12° C. Living (motile) spirochetes were observed in the gut-contents of the bugs up to 6 days at 12°, but only up to 6 hours at 20 to 24°. The observations made at various temperatures appear to indicate that the spirochetes are simply digested by the bug and that their more rapid disappearance from the insect's gut at higher temperatures is dependent upon the insect's digesting its food more rapidly when kept warm. . . . Although the bug is not the true host of *S. duttoni* it is conceivable that it may serve as a mechanical carrier of the parasite. . . .

"The foregoing experiments, whilst not sufficiently numerous to permit of any final conclusions, appear to indicate that *S. obermeieri* may die out more rapidly than *S. duttoni* in the gut of the bug. It is possible that the bugs digested their food more rapidly owing to their being more hungry than the lot used for experiments with *S. duttoni*.

"It has been demonstrated by one experiment that *A. lectularia* fed on an infected mouse and immediately afterwards upon a healthy mouse is capable of transmitting the spirochete."

Leucocytozoon musculi, a parasitic protozoon from the blood of white mice, ANNIE PORTER (*Proc. Zool. Soc. London, 1908, III, pp. 703–716, pl. 1, fig. 1*).—Studies of a microscopic organism found in the leucocytes of mice. This the author considers the first recorded from the mouse.

A monozoic cestode-like blood parasite (Saguinicola armata and inermis), MARIANNE PLEHN (*Zool. Anz., 33 (1908), No. 13, pp. 427–440, figs. 6*).—This parasite occurs in the blood system of Cyprinid fishes.

Helminthological technique, M. LANGERON (*Arch. Par., 12 (1908), No. 1, pp. 150–154; abs. in Jour. Trop. Vet. Sci., 3 (1908), No. 4, pp. 495–498*).—Directions are given for the fixing, staining, mounting, and preservation of cestodes, trematodes, and nematodes, and the eggs of these parasites. The formulas of the reagents used are included.

RURAL ENGINEERING.

Irrigated lands of United States, Canada, and Mexico, C. R. PRICE (*Los Angeles, Cal., 1908, pp. 71, figs. 17, maps 4*).—This is a compilation of data concerning public and private irrigation enterprises with descriptions of the irrigated lands and the surrounding conditions. Its aim is stated to be to furnish comprehensive information to "expert, engineer, colonist, or homeseeker." In

the pamphlet is a synopsis of the Federal laws relating to the preemption of lands and it includes information published by the Department of the Interior of interest to colonist or homeseeker.

[Irrigation investigations in California], F. W. Roeding (*Rpt. State Engin. Cal., 1907–8, pp. 153–156*).—A brief review of the cooperative work of the irrigation investigations of this Office and the State of California.

[Irrigation in Madras Presidency], P. F. Martin (*Engineer [London], 107 (1909), No. 2770, 109, 110*).—An account is given of the projects being undertaken by the British Government, in one of which it is proposed to erect the largest dam in the world. The proposed works are described, with figures as to drainage areas, reservoir capacities, dimensions of structures, and estimates of cost.

Mechanical irrigation stations on the Nile, J. B. Van Brussel (*Engin. Mag., 36 (1909), No. 5, pp. 749–764, figs. 17*).—In this article there is described a plant located at Wadi-Kom-Ombo in upper Egypt, which will make use of part of the additional water of the Nile stored up by the Assuan Barrage. The area to be irrigated covers 150,000 acres of land where the crops will be absolutely dependent on the pumps. Reliability was therefore a prime consideration, and the pumps had to be of the centrifugal type because of the large amount of silt in the water of the Nile.

The mechanical equipment comprises centrifugal pumps with 2-meter suction pipes, operated by horizontal 4-cylinder, triple-expansion engines, and also a steel canal 5,200 feet long, nearly semicircular in cross section. By the use of a fuel economizer an increase in efficiency of 5 per cent will be obtained. Further data regarding the pumps and engines and the methods employed in the construction of the canal are given in the article.

Tidal power, W. C. Hornsnaill (*Engineer [London], 107 (1909), Nos. 2774, pp. 214–226, figs. 7; 2775, pp. 233, 234, figs. 3*).—In the first of these articles the writer considers the factors involved in utilizing tidal power, with a mathematical discussion as to the amount of power available from a given rise and fall and as to the efficiency of tide mills, with examples of developments.

A discussion of the economy of tidal power as compared with that of steam or gas is given in the second article, showing it to be too low to compete with them at the present value of coal.

Third Biennial Report State Engineer, North Dakota (*Bien. Rpt. State Engin. N. Dak., 3 (1907–8), pp. 77, pls. 3, dgm. 1*).—In this are contained reports of drainage projects, preliminary surveys of irrigation projects, accounts of hydrographic surveys of several important rivers of the State, with data and a discussion of the relation between rainfall and stream flow in the State. There is also an account of the progress being made under the various irrigation projects being carried on.

Peat levees, N. Ellery (*Rpt. State Engin. Cal., 1907–8, pp. 88–92*).—The writer makes recommendations as to construction and maintenance of peat levees. Among the recommendations are planting willows on the berm and up the outside slope, as it is believed that by doing this the roots will interlace the soil so as to give it increased resistance to water pressure.

The automatic water finder (*Impl. and Mach. Rev., 34 (1908), No. 406, p. 1238, fig. 1*).—The instrument here described is reported to have been successfully used for locating underground water courses. It is stated that the operation of the instrument is based upon the measurement of electric currents constantly flowing between the earth and atmosphere. These are strongest in the vicinity of subterranean flowing waters, the strength being indicated by the deflection of a needle.

Road improvement in the United States (*Good Roads Mag., n. ser., 10 (1909), No. 3, pp. 85–91, figs. 7.*)—This is a compilation of brief reports submitted from about one-half of the States, showing the progress made during 1908 and the prospects for 1909.

Superheated-steam plowing machine (*Maschinen Ztg., 6 (1908), No. 23, pp. 267–270, figs. 5*).—This is a description of a plowing machine using superheated steam, which is meeting with considerable success in Germany. Greater power with less water and coal consumption than with the ordinary steam engine is claimed for it. By an attachment so placed that the hottest gases as they leave the fire box pass through the tubes a superheat of 300° C. is obtained. The arrangement of the pipes and connections is explained and illustrated in the article.

In addition to the superheating arrangement this locomotive embodies many other novel features.

New milking machine systems, R. Georgs (*Maschinen Ztg., 7 (1909), No. 3, pp. 26–31, figs. 3*).—The evolution of the milking machine and the difficulties encountered in its practical application are discussed briefly. There follows a description of the principles and construction of two new types of machines, with an account of experience with them.

Machine milking and its practical application, G. Ellbrecht (*Mælkeritid., 21 (1908), No. 50, pp. 996–1004*).—A general discussion of the subject, with descriptions of a number of milking machines, among them being several new types.

Milking machines (*Norsk Landmandsblad, 27 (1908), No. 41, pp. 503–506, figs. 3*).—Special mention is made of two Swedish machines, with illustrations of both in operation.

Ventilation of poultry houses, K. J. J. Mackenzie and E. J. Russell (*Trans. Highland and Agr. Soc. Scot., 5. ser., 20 (1908), pp. 87–100, figs. 3*).—Experiments with different types of poultry houses showed that in the presence of 6 to 8 parts of carbonic acid per 10,000 volumes of air the birds were apparently healthy. Nine volumes is believed to be the maximum content that a poultry house should contain. In order that this degree of purity may be obtained each bird must be allowed 40 cu. ft. of air per hour. In building a poultry house each bird should be allowed 10 cu. ft. of space and there should be top ventilation.

RURAL ECONOMICS.

Cyclopedia of American agriculture. Farm and community, L. H. Bailey et al. (*New York, 1909, vol. 4, pp. XIV+650, pls. 25, figs. 163*).—This is the last of the series of volumes devoted to agriculture in the United States and Canada, the other volumes having been previously noted (E. S. R., 20, p. 778).

This volume contains 10 chapters which treat, respectively, of the agricultural wealth of North America, the historical evolution of North American agriculture, including a list of current agricultural periodicals, phases of the agricultural shift, the natural resources of agriculture, land and labor, business organization in agriculture, social and service associations, education by means of agriculture, governmental and legal aid and control, and biographies of persons who have aided in the development of agriculture in North America.

The articles under the different chapters have been prepared by specialists, and particular attention is given to the bearing of the agricultural industry on the economic and social welfare of communities. Bibliographies are appended to many of the articles.

The influence of immigration on agricultural development, J. L. COULTER (*Ann. Amer. Acad. Polit. and Soc. Sci., 33 (1909), No. 2, pp. 373–379*).—This article discusses the advantages, both to agricultural wealth production and to the economic welfare of the laborers, of the proper location of farm immigrants in parts of the country which conform as nearly as possible in physical environment, agricultural methods, and crops produced to their native lands. The results of such settlements by Swiss, Bohemians, Poles, Russians, Italians, etc., in different parts of the country are briefly discussed with reference to agriculture as a whole, to such particular branches of the industry as cheese making, and to the farm labor problem in the United States.

The Italian as an agricultural laborer, A. PECORINI (*Ann. Amer. Acad. Polit. and Soc. Sci., 33 (1909), No. 2, pp. 380–390*).—This article presents data on the number of Italians and the branches of the agricultural industry in which they are engaged in New York, Connecticut, Massachusetts, New Jersey, Pennsylvania, North and South Carolina, Ohio, Louisiana, Arkansas, Alabama, Texas, and California. Truck farming and the raising of cotton, sugar cane, tobacco, rice, and fruits are their principal lines of work. The best results are said to be attained when the Italian owns his land or is a tenant, "but decidedly he is not adapted to be exploited as a day laborer under the peonage system."

The Jewish Agricultural and Industrial Aid Society, A. JARETZKI ET AL. (*Jewish Agr. and Indus. Aid Soc. Ann. Rpt. 1908, pp. 58*).—This is the annual report for the year 1908. The purpose of this society is to assist, encourage, and instruct Jewish farmers engaged in agriculture. At the close of the year there were 2,409 farmers occupying 2,164 farms, and this is believed to represent only about 50 per cent of the number of Jewish farmers in the United States. The loans granted and the educational and other features of the society for encouraging agriculture are presented in detail.

Concerning settlements of farm laborers in East Prussia (*Illus. Landw. Ztg., 29 (1909), No. 10, pp. 82, 83*).—This article discusses the purposes of agricultural labor settlements and the conditions which lead to success. Among the latter are mentioned the profitableness of agriculture, the fertility of the land, and the capability of the farm laborer. The development of the laborer into an independent farmer, it is believed, rests upon the last factor more than on any other, and it is thought that this has not been sufficiently considered by those who have advocated the establishment of small holdings as a solution of the agricultural labor problem in Prussia.

Concerning settlements of farm laborers, DAVERHUTH ET AL. (*Illus. Landw. Ztg., 29 (1909), No. 14, pp. 123, 124*).—These two articles discuss the ineffectiveness of land settlements to solve the farm labor problem in Germany. The authors contend from observations and experience that the regular farm hand on the average farm is better off than the small holder in agricultural colonies working for himself.

The land and the landless, G. CADBURY, Jr., and T. BRYAN (*London, 1908, pp. VIII+182, dgms. 2*).—This is a history of the agrarian problem in England with particular reference to the economic and social status of farmers and farm laborers, in which it is suggested "that the rural problem will not be solved by settling a large number of men on small farms, but that it is also necessary to set up in rural England such conditions of life and industry as shall make small farms permanently possible." The conditions which will make for success are, the authors believe, to increase the size of small holdings to from 20 to 60 acres, a sound system of furnishing capital, cooperation among

farmers, subsidiary industries to small holdings, afforestation, and a graded and better system of agricultural education.

An extensive bibliography is appended.

Small holdings and the law of April 10, 1908 (*Jour. Agr. Prat., n. ser., 17 (1909), No. 7, p. 202*).—A brief discussion of the chief features of the law (E. S. R., 20, p. 191), which provides for the use of government funds not exceeding 100,000,000 francs (about $20,000,000) at 2 per cent interest, in its bearing on the economic and social welfare of the owners of small farms in France.

Provisions of cottages and allotments in France (*Jour. Bd. Agr. [London], 15 (1909), No. 11, pp. 863, 864*).—Notes are given on the more important features of the law of April 10, 1908, relating to government assistance to farm laborers for the purchase, improvement, control, and disposition of small holdings.

A small holders' Utopia, H. Beaumont (*Farm and Garden, 10 (1909), Nos. 489, p. 134; 490, p. 151*).—This is a brief history of the South Lincolnshire Small Holdings Association since 1886. Some of the features of the work which have proved successful are common pasturage, the erection of cottages, and copartnership farms. The beneficial results on the economic and social welfare of the tenants and their families are particularly emphasized.

Cooperative societies for the purchase of farming requisites (*Jour. Bd. Agr. [London], 15 (1909), No. 12, pp. 917–924; Country Life [London], 25 (1909), No. 637, p. 398*).—An account of the organization, objects, membership, and business transactions of cooperative societies in Great Britain.

Report of the Irish Agricultural Organization Society, Limited, H. Plunkett and R. A. Anderson (*Rpt. Irish Agr. Organ. Soc. 1908, pp. 105*).—Detailed statistical data and discussions of the work of the affiliated cooperative organizations for the year ended June 30, 1908, are given. The societies numbered 941, as compared with 873 in 1907 (E. S. R., 20, p. 289), of which 299 were cooperative creameries, 270 mutual credit societies, and 174 agricultural organizations.

Statistics of agricultural associations in 1907 (*Bul. Admin. Agr. [Brussels], 2 (1909), No. 2, pp. 15–64, maps 4*).—Complete returns of agricultural cooperative associations in Belgium on December 31, 1907, are reported, discussed, and illustrated.

The societies are grouped into agricultural business associations of various kinds, numbering 1,271; organizations for the purchase of seeds, fertilizers, feeding stuffs, and machinery, which numbered 1,024; societies for the sale of milk and the manufacture and sale of butter and cheese, numbering 497 in active operation; agricultural credit societies, which numbered 543, and societies insuring live stock, of which there were 1,023.

Agricultural associations in Portugal, L. de Castro (*Bul. Soc. Nat. Agr. France, 68 (1908), No. 10, pp. 782–788*).—Data are presented regarding the population and agricultural conditions of Portugal (E. S. R., 20, p. 587), and a brief history is given of agricultural cooperative associations from 1297 to the present time. Portugal has only about 100 associations, but government interest in them is shown by the fact that the parliament recently passed a law authorizing the use of 25,000,000 francs (about $5,000,000) for the promotion of agricultural credit.

Danish agriculture in 1908, H. Hertel (*Tidsskr. Landökonomi, 1909, No. 1, pp. 1–42*).—This is the annual summary of the general conditions of Danish agriculture for the year 1908.

Norwegian agriculture in 1908 (*Norsk Landmandsblad, 28 (1909), No. 1, pp. 1–10*).—A general survey.

AGRICULTURAL EDUCATION.

The farmer's chance to grow intellectually in his business, J. W. Cook (*Ann. Rpt. Ill. Farmers' Inst., 13 (1908), pp. 234–245*).—The central thought of this address is that scientific interest is the characteristic of the age and that the farmer is at the center of "the scientific situation." Only work is educative, and the farmer's work is more educative than that of any other industrial laborer because of its freedom from meaningless repetition. The farm must become a school if its resources are to be transmitted unimpaired to later generations. "Education for social efficiency is the modern watchword."

Studies in the history of modern education, C. O. Hoyt (*New York, Boston, Chicago, 1908, pp. 223, pls. 7, maps 3, figs. 2*).—This book presents certain fundamental facts in the history of education, with suggestions for their discussion, questions to invite thought and encourage research, and directions for assisting such research. It is preeminently designed as a college text, but contains a good bibliography of reference works for the general reader. The chapter headings name the representative educators and the epochs for which each stands. The term agricultural education does not appear in the index of the volume, nor is it mentioned in the single reference made to industrial training. Nor is allusion made to the American system of land-grant colleges.

Education, F. A. Nicholson (*Note on Agriculture in Japan. Madras, 1907, pp. 77–91*).—This article, which forms a part of a treatise previously noted (E. S. R., 20, p. 892), includes brief accounts of and statistical data concerning science and agriculture in primary schools in Japan, supplementary (continuation) schools, regular agricultural schools, higher agricultural education, education in forestry, farm schools, private schools, itinerant teaching, support of schools, and results and cost of ordinary agricultural education.

The beginnings of college history, M. F. Dickinson (*Boston, 1908, pp. 17*).—This address, delivered on the occasion of the fortieth anniversary of the founding of the Massachusetts Agricultural College, presents a very interesting review of the movements which led to the establishment of that institution.

The educational organization of nature study, Mary P. Anderson (*Jour. N. Y. Bot. Gard., 10 (1909), No. 111, pp. 56–63*).—Attention is called to the modern viewpoint as to the proper subject-matter for nature-study work, i. e., its relation to the life of the child.

The June-bug is not studied merely as an example of the beetles, but is approached through the fat white grub that is responsible for the patches of dead grass in our lawn. The star-fish no longer gets its interest for the child as a classic example of the radiates, but from the fact that it also eats oysters. The child is not ready for the scientific classification attempted in early nature-study programmes; he is the center of his own universe, which must be explored in gradually-widening circles.

The author suggests home and its immediate surroundings, home geography, and industrial geography, as the important centers of activity for the first 5 grades.

Nature study by grades, H. H. Cummings (*New York, Cincinnati, Chicago, 1908, pp. 180, figs. 44*).—This book is the outgrowth of a series of exercises prepared for training teachers in the Utah State Normal School, but is applicable to general nature study. An important feature is the graded arrangement of topics (for the first three grades) on a plan which insures against useless repetition.

An elementary study of corn, V. M. Shoesmith (*Agr. Col. Ext. Bul. [Ohio State Univ.], 4 (1909), No. 8, pp. 16, figs. 13*).—The writer has included in this

bulletin data for a serviceable public school manual on the selection and study of seed-corn.

The house fly as a carrier of disease, W. L. Underwood (*Hampton Leaflets, n. ser., 5 (1909), No. 3, pp. 8, figs. 2*).—This leaflet deals with the house fly as a carrier of disease. It contains a reproduction of a fly's footprints on a plate of jelly as shown by the colonies of bacteria which developed from them in 12 hours.

Illinois Arbor and Bird Days, F. G. Blair (*Springfield, Ill.: Dept. Pub. Instr., 1909, pp. 95, figs. 64*).—This bulletin is unusually well illustrated with half-tone engravings of fruit and flowering trees, vines, palms, ferns, house and garden plants, and all the common birds of the State. The economic value of birds is fully explained, and a chapter is given to the propagation and distribution of game birds by the State.

Wisconsin Arbor and Bird Day annual, 1909, O. S. Rice (*Madison, Wis.: State Supt. of Pub. Instr., 1909, pp. 120, pls. 6, figs. 14*).—In addition to other matter, this contains 6 colored plates illustrating the rose-breasted grosbeak, black and white creeping warbler, American sparrow hawk, barn swallow, screech owl, and horned lark.

Elements of Philippine Agriculture, E. B. Copeland (*Yonkers-on-Hudson, N. Y., and Manila, 1908, pp. XV+192, figs. 126*).—This text on elementary agriculture, designed for the island schools, deals with the subject from the standpoint of the native agricultural soils, plants, and insects, but includes maize and several other crops that are common to America. Among those peculiar to the region may be mentioned the jack-fruit, papaya, taro, ampalaya, abacá, mangosteen, atis, and chico. The book includes directions for school gardens, experiments, plant records, and the use of tools, and is illustrated to show the contrast between primitive Philippine implements and methods and the most modern developments, such as the steam plow and grain thrasher.

A practical arithmetic, F. L. Stevens, T. Butler, and Mrs. F. L. Stevens (*New York, 1908, pp. IX+386*).—This arithmetic is distinguished by the large proportion of agricultural problems, these forming probably 75 per cent of the whole number given. They convey, mostly by implication, a large amount of information on seed selection, judicious use of fertilizers, balancing of animal rations, crop rotation, prevention or treatment of plant diseases, conservation of soil moisture and soil fertility, prevention of insect injury, methods of harvesting, dairying and herd improvement, poultry culture, good roads, etc.

MISCELLANEOUS.

The importance of scientific experimentation in agriculture, J. Schroeder (*7. Cong. Rural An. [Uruguay], 1908, pp. 31–60, figs. 7*).—A paper presented at the Seventh Annual Rural Congress of Uruguay. Some of the beneficial results secured from systematic agricultural experimentation in other countries are pointed out and a plea is made for the development of such work in Uruguay.

Preliminary report of the Territorial Conservation Commission of Hawaii (*Hawaii. Forester and Agr., 5 (1908), No. 12, pp. 334–347*).—This report includes a summary of data as to the nature and present condition of the natural resources of the Territory, with recommendations as to their development and use.

Conservation of Hawaii's natural resources (*Honolulu: Bd. Comrs. Agr. and Forestry, 1909, pp. 21*).—This consists of the addresses before the Territorial legislature March 1, 1909, by the governor and his conferees who attended the governors' conference with the President in Washington, D. C., in May, 1908, and by others

Twenty months of the administration of the minister of agriculture, E. R. MEXIA (*Veinte Meses de Administración en el Ministerio de Agricultura. Buenos Ayres, 1908, pp. 297*).—This is a report of the minister of agriculture of Argentina for the 20 months ending with October, 1907.

Report of the department of agriculture of Finland, 1905 (*Landtbr. Styr. Meddel, 1907, No. 55, pp. X+218*).—The usual reports on the agricultural conditions of the year are given, together with data as to the work of the various agricultural, educational, and research institutions for the advancement of agriculture.

Report of the department of agriculture of Sweden, 1906, M. VON FEILITZEN ET AL. (*K. Landtbr. Styr. Underdåniga Ber. 1906, pp. [VI]+504+VII*).—The report contains the usual accounts of the various agencies for the promotion of Swedish agriculture, with reports of the work of the agricultural and other schools, and the chemical and seed control stations during the year.

Report of the Third Scandinavian Agricultural Congress, Christiania, 1907, H. TVETER (*Beretning om den 3 die Nordiske Landbrugskongres i Kristiania 1907. Christiania, 1908, vols. 1, pp. 170; 2, pp. 674*).—Volume 1 contains the transactions of the congress, with reports of the discussions following the reading of the papers, which are given in full in volume 2.

The agricultural service and laboratories of Indo-China (*Bul. Écon. Indo-Chine, n. scr., 11 (1908), No. 70, pp. 1–33*).—A detailed description of the organization and work of the Indo-China agricultural service, including the Bureau of Agriculture, inspection and control work, and experiment stations.

The work of the minister of agriculture, industry, and commerce through the public library, V. STRINGHER (*L'Opera del Ministero d'Agricoltura, Industria e Commercio per le Biblioteche Popolari. Rome: Govt., 1909, pp. 45; Bol. Uffic. Min. Agr., Indus. e Com. [Rome], 7 (1908), VI, No. 7–8, pp. 721–760*).—An address presented at the First National Public Library Congress, held at Rome, December 6–9, 1908. An account of the organization of agricultural circulating libraries is presented, together with the regulations adopted and catalogues of the books sent out by the various organizations engaged in this work.

The traveling instructor in agriculture and the public library, E. FILENI (*Bol. Quind. Soc. Agr. Ital., 14 (1909), No. 3, pp. 101–107*).—An address delivered at the above congress in which the use of circulating libraries in extension work is discussed.

General index to volumes 26–40 of Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, Erste Abteilung: Medizinisch-hygienische Bakteriologie und tierische Parasitenkunde, G. LINDAU (*Jena, 1908, pp. 429*).—This contains an author index, a subject index, and an index of illustrations to these volumes.

General index to volumes 11–20 of Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, Zweite Abteilung: Allegemeine, landwirtschaftlich-technologische Bakteriologie, Gärungsphysiologie und Pflanzenpathologie, K. TAUTZ (*Jena, 1908, pp. 246*).—This contains an author index, a subject index, and an index of illustrations to these volumes.

NOTES.

Connecticut State Station.—Dr. E. M. East, who has been in charge of the work in plant breeding, has accepted an assistant professorship in Harvard University, where his time will be exclusively occupied in research in plant breeding. His resignation takes effect September 1.

Idaho University and Station.—E. E. Elliott, dean of the college of agriculture, has been appointed director of the station.

Maryland Station.—C. W. Melick has resigned as dairy husbandman to accept a position as bacteriologist with a dairy concern in Omaha, Nebr., his resignation becoming effective September 1. A. L. Stabler, a 1909 graduate of the college, has been appointed assistant in animal husbandry in connection with the investigations with hogs and sheep.

New Mexico College and Station.—J. H. Squires, Ph. D., who has been engaged in graduate work at Cornell University for the past two years, has been appointed associate professor of agriculture, and will enter upon his duties at once. He will also be connected with the station.

Cornell University and Station.—Dean Bailey has been given leave of absence for the ensuing academic year, during which time Dr. H. J. Webber will serve as acting dean and director. G. W. Cavanaugh, H. H. Whetzel, E. O. Fippin, G. F. Warren, W. A. Stocking, jr., and G. N. Lauman have been promoted from assistant professorships to professorships. Other recent appointments include as assistant professors, G. W. Herrick, recently of the Texas College and Station, in economic entomology, C. R. Crosby in entomological investigations, A. W. Gilbert, Ph. D. (Cornell, 1909), and H. H. Love in plant breeding investigations, Donald Reddick in plant pathology, J. G. Needham in limnology and general biology, H. E. Ross in dairy industry, and H. W. Riley in farm mechanics; as instructor, K. C. Livermore in farm crops; and as assistants, F. S. Harris in soil technology, Robert Matheson in entomology, W. S. Lyon in poultry investigations, A. T. Moir in poultry husbandry, and L. B. Cook in dairy industry.

A series of farm barns and greenhouses is being erected.

Office of Experiment Stations.—L. W. Fetzer, Ph. D., assistant chemist of the Maryland Station, has accepted a position on the editorial staff of *Experiment Station Record*, to have charge of the work in agricultural chemistry. He will enter upon his new duties about September 1. J. M. Stedman, entomologist of the Missouri University and Station, has been appointed assistant farmers' institute specialist beginning May 21. F. W. Howe, instructor in agriculture at the Michigan College and of long experience as teacher and principal of public schools in Michigan, has been appointed assistant in agricultural education, and has entered upon his duties.

The Automobile in Agriculture.—It is announced in *La Moto-Culture*, a new monthly journal devoted to the agricultural motor and its applications, that the First International Congress of the Agricultural Automobile and the Application of Mechanical Motors in Agriculture will be held at Amiens, France, July 22 and 23, 1909, in connection with the Second International Exposition of the Agricultural Automobile and the Agricultural Motor. The address of the general secretary is 166 Boulevard de Magenta, Paris.

INDEX OF NAMES.

INDEX OF SUBJECTS.

NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective experiment stations; "Alaska," "Hawaii," and "P. R." to those of the experiment stations in Alaska, Hawaii, and Porto Rico; "Can." to those of the experiment stations in Canada, and "U. S. D. A." to those of this Department.

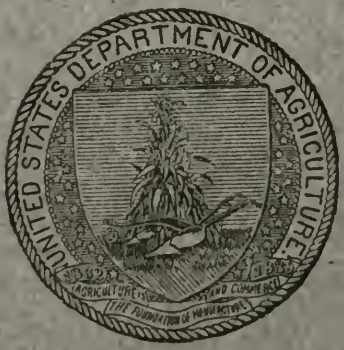
U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

A. C. TRUE, DIRECTOR

Vol. XX MARCH, 1909 No. 7

EXPERIMENT STATION RECORD



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1909

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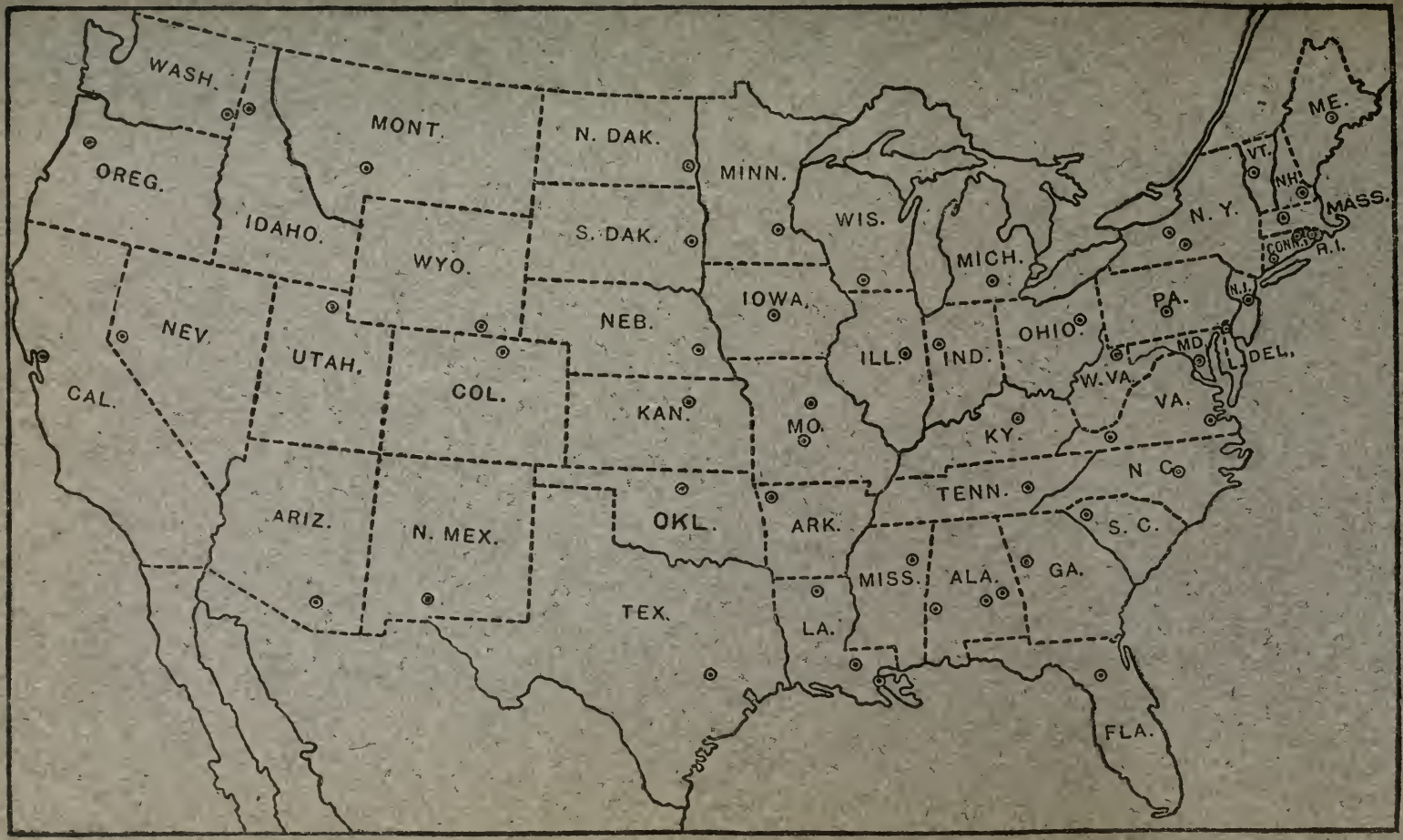
[a] Director. [b] Special agent in charge. [c] Acting director. [d] Superintendent.

BULLETINS OF THE OFFICE OF EXPERIMENT STATIONS.

Experiment Station Record, Vols. I–XIX, with indexes; Vol. XX, Nos. 1–6.

Bulletins.—Nos. 1, Organization and History of the Stations; 2, Digest of Reports of the Stations, 1888; 3, Meeting of Horticulturists, 1889; 4, List of Station Horticulturists; 5, 12, 13, 19, 23, 27, 39, 47, 59, 74, 88, 111, 122, 137, 151, 161, 176, 197, 206, Organization Lists of Stations and Colleges; 6, List of Station Botanists; 7, 16, 20, 24, 30, 41, 49, 65, 76, 99, 115, 123, 142, 153, 164, 184, 196, Proceedings of Association of Colleges and Stations; 8, 22, 106, Investigations at Rothamsted; 9, Fermentations of Milk; 10, Meteorological Work for Agricultural Institutions; 11, A Compilation of Analyses of American Feeding Stuffs; 14, Convention of National League for Good Roads; 15, Handbook of Experiment Station Work; 17, Suggestions for Food Laboratories; 18, Assimilation of Nitrogen by Mustard; 25, Dairy Bacteriology; 26, Experiment Stations—Their Objects and Work; 28, Composition of American Food Materials; 29, 53, 89, 187, Nutrition Investigations, University of Tennessee; 31, Dietary Studies, University of Missouri, 1895; 33, The Cotton Plant; 35, Nutrition Investigations in New Jersey; 36, Irrigation in Connecticut and New Jersey; 37, Dietary Studies, Maine State College; 38, 71, Dietary Studies of Negroes in Alabama and Eastern Virginia; 40, 54, Dietary Studies in New Mexico; 42, Cotton Culture in Egypt; 43, Losses in Boiling Vegetables, and the Composition and Digestibility of Potatoes and Eggs; 44, 45, 63, 69, 169, 117, 121, 136, 175, Metabolism Experiments; 46, 116, Dietary Studies in New York City; 48, 62, 82, 94, Reports to Congress on Agriculture in Alaska; 50, 61, 83, 93, Reports on the Work and Expenditures of the Agricultural Experiment Stations; 51, 64, 78, 97, 114, 128, Statistics of Colleges and Stations; 52, Nutrition Investigations in Pittsburg, Pa., 1894–1896; 55, Dietary Studies in Chicago; 57, Varieties of Corn; 58, Water Rights on the Missouri River and Tributaries; 60, Laws for Acquiring Titles to Water from the Missouri River and Tributaries; 66, Physiological Effect of Creatin and Creatinin; 67, 85, 101, 120, 143, 156, Studies on Bread and Bread Making; 68, Some Chinese Vegetable Food Materials and Their Value; 70, Water-Right Problems of Bear River; 72, Farmers' Reading Courses; 73, Irrigation in the Rocky Mountain States; 77, Digestibility of American Feeding Stuffs; 79, Farmers' Institutes—History and Status; 80, Experiment Stations in the United States; 81, Irrigation in Wyoming and its Relation to Ownership and Distribution; 84, Nutrition Investigations, California Experiment Station; 86, Use of Water in Irrigation; 87, Irrigation in New Jersey; 90, Irrigation in Hawaii; 91, Nutrition Investigations, University of Illinois, North Dakota Agricultural College, and Lake Erie College, Ohio; 92, Reservoir System of the Cache la Poudre Valley; 95, Report on the Agricultural Resources and Capabilities of Hawaii; 96, Irrigation Laws of the Northwest Territories; 98, The Effect of Muscular Work on Food Consumption, Digestion, and Metabolism of Bicyclers; 100, Report of Irrigation Investigations in California; 102, 141, 162, Cooking of Meats; 103, Evolution of Reaping Machines; 104, 119, 133, 158, Reports of Irrigation Investigations, 1900, 1901, 1902, 1904; 105, Irrigation in the United States; 107, 132, Fruit and Chinese Dietaries in California; 108, Irrigation Practice Among Fruit Growers on the Pacific Coast; 110, 120, 138, 154, 165, 182, 199, Proceedings of Farmers' Institute Workers; 112, Agricultural Experiment Stations in Foreign Countries; 113, Irrigation of Rice in the United States; 118, Irrigation from Big Thompson River; 124, Report of Irrigation Investigations in Utah; 125, A Digest of Recent Experimenta on Horse Feeding; 127, Instruction in Agronomy at Some Agricultural Colleges; 129, Dietary Studies in Boston, Springfield, Philadelphia, and Chicago; 130, Egyptian Irrigation; 131, Plans of Structures in Use on Irrigation Canals in the United States; 134, Storage of Water on Cache la Poudre and Big Thompson Rivers; 135, Legislation Relating to Farmers' Institutes; 139, Special and Short Courses in Agricultural Colleges; 140, Acquirement of Water Rights in the Arkansas Valley in Colorado; 144, 190, Irrigation in Northern Italy; 145, Preparing Land for Irrigation and Methods of Applying Water; 146, Current Wheels—Their Use in Lifting Water for Irrigation; 147, Report on Drainage Investigations, 1903; 148, Report on Irrigation Investigations in Humid Sections of the United States; 149, Studies of the Food of Maine Lumbermen; 150, Dietary Studies at the Government Hospital for the Insane, Washington, D. C.; 152, Dietary Studies with Harvard University Students; 155, Agricultural Instruction for Adults in the British Empire; 157, Water Rights on Interstate Streams; 159, A Digest of Japanese Investigations on the Nutrition of Man; 160, School Gardens; 163, Agricultural Instruction for Adults in Continental Countries; 166, Course in Cheese Making for Movable Schools of Agriculture; 167, Irrigation in the North Atlantic States; 168, The State Engineer and His Relation to Irrigation; 169, 170, 171, Reports of Agricultural Investigations in Alaska, Hawaii, and Porto Rico, 1905; 172, Irrigation in Montana; 173, Corn-Harvesting Machinery; 174, History of Farmers' Institutes in the United States; 177, Evaporation Losses in Irrigation and Water Requirements of Crops; 178, Course in Fruit Growing for Movable Schools of Agriculture; 179, Small Reservoirs in Wyoming, Montana, and South Dakota; 180, Publications of the Agricultural Experiment Stations in the United States; 181, Mechanical Tests of Pumping Plants in California; 183, Mechanical Tests of Pumps and Pumping Plants Used for Irrigation and Drainage in Louisiana; 185, Iron in Food and Its Functions in Nutrition; 186, Exercises in Elementary Agriculture—Plant Production; 188, Irrigation in the Yakima Valley, Washington; 189, Report on Drainage of Eastern North Dakota; 191, Tests of Internal-Combustion Engines on Alcohol Fuel; 192, Irrigation and Drainage Laws of Italy; 193, Studies of the Effect of Different Methods of Cooking upon the Thoroughness and Ease of Digestion of Meat, University of Illinois; 194, A Review of Investigations in Soil Bacteriology; 195, Simple Exercises Illustrating Some Applications of Chemistry to Agriculture; 198, Prevention of Injury by Floods in the Neosho Valley, Kansas; 200, Course in Cereal Foods and Their Preparation for Movable Schools of Agriculture; 201, Cost of Pumping from Wells for the Irrigation of Rice in Louisiana and Arkansas; 202, Digestibility of Starch of Different Sorts as Affected by Cooking; 203, Distribution of Water in the Soil in Furrow Irrigation; 204, School Gardening and Nature Study in English Rural Schools and in London; 205, Irrigation in Wyoming; 207, Irrigation in the Sacramento Valley, California.



THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES